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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

New Car-Wheel Boring Machine.

For boring wheels a very stiff machine is required. It is the usual practice to finish a wheel with two cuts, the first or roughing cut taking out the most of the metal to be removed. The finishing cut is run through at a fast feed, taking out very little metal.

This work is forced to the utmost capacity of the tools. It is, therefore, important that the machine should be very stiff and perfectly rigid under the heaviest cuts.

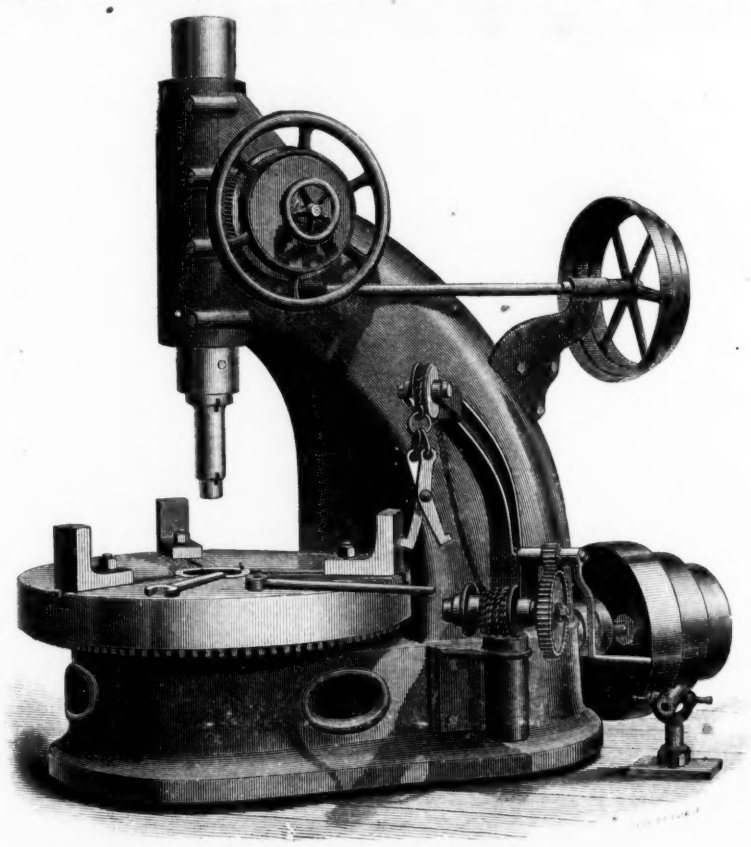
The car wheel boring machine we illustrate on this page is one of the strongest machines built for this purpose. The weight is 8,400 lbs. The metal in the upright is distributed in the very best manner to resist the strains to which such a machine is subjected. It will be noticed that the form of the upright is not square or rectangular in section. It extends well back, and in front encircles about one-fourth the diameter of the chuck. This arrangement affords a broad base, and a very strong upright, preventing any spring in the machine.

Mr. C. C. Millard, now President and Superintendent of the Indianapolis Car and Manufacturing Company, states that he has bored 150 wheels in ten hours on two of these machines. Core was from 3⅝ to 3¾ inches; size of finished hole, 4¼ inches; depth of hub, 7 inches.

The chuck is made very strong in order to stand the hard usage such a machine usually receives. The crane is so constructed as to swing directly over the center of the chuck. By this arrangement the handling of wheels is greatly facilitated, being carried by the crane to the center and dropped into position.

The cone has three speeds for a 5-inch belt. The feeds are operated by belt, and have ample range. The boring bar is operated by a steel rack accurately cut. It is counterweighted, and has quick return.

This machine is built by the Niles Tool Works, of Hamilton, Ohio.



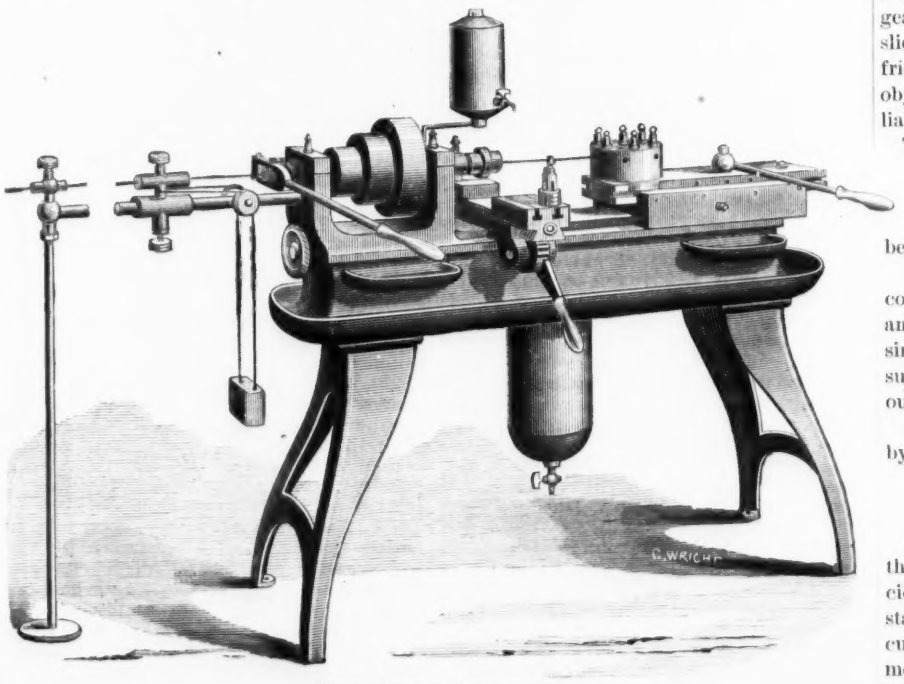
NEW CAR WHEEL BORING MACHINE.

New Screw Machine.

We present herewith an engraving of a new screw machine, the invention of Jerome B. Secor. The bed of the machine, the gutter which surrounds it for catching the oil, and the head for carrying the spindle are all in a single casting. The legs are of a shape which is calculated to give great strength and rigidity, and are bolted to the bed. The spindle is of steel, is hollow, and has ground journals. The boxes are lined with the best babbitt metal, so that no other metal comes in contact with the spindle. When these boxes become worn out, they may be re-babbitted and bored by a special device exactly parallel with the top and sides of the bed. This is a very difficult operation to perform on some other machines built for the same kind of work. The cone has three speeds, and is of unusually large diameter for the size of the machine.

Between the box and chuck upon the spindle is a hardened steel collar. The end play of the spindle is taken up by a collar fitting a thread upon the spindle at the small end of the cone. By slacking a screw which holds the collar from turning, it may be turned so as to take up all the end play, and adjusted as desired. The chuck for holding the wire is a new and valuable feature of this machine. It has three jaws, which are adjusted by a worm and wheel. A thread is cut inside the wheel to fit a thread upon the spindle. The worm is operated by a special wrench made for that purpose. Jaws are composed of six wedges placed above each other to form the three jaws. By turning the worm the wheel is made to move along the spindle, carrying with it three wedges, which open or close the jaws. By this construction of parts one set of jaws is made to answer for holding all sizes of wire that will pass through the hollow spindle, without the necessity of extra jaws and sleeves, as is the case in many instances. A sleeve passing through the spindle has a collar at one end to open and close the jaws of the chuck, while the other end of this sleeve is connected with a hand lever. This lever is well supported by a link and blocks, with large wearing surfaces, and is designed to exert a direct strain upon the sleeve. An end motion of ⅛ inch of the sleeve will open and close the jaws of the chuck.

The wire is placed through the spindle and collar upon the stand, and held by a thumb screw upon the collar. When the jaws of the chuck are opened, the wire is pulled forward by means of the weight shown attached to the collar. In closing the jaws, the wire is not pushed forward, as is the case with some other screw machines, and which has proved a serious difficulty upon some kinds of work.



NEW SCREW MACHINE.

The turret attachment for holding the tools, instead of being moved to and fro by means of a lever in the usual way, is operated by a toothed segment placed underneath the top slide, and engages teeth in a wrought iron rack let into the back side of slide. The segment has an upright journal which passes through the top of slide and has a tapered fit in the end of lever. By loosening the nut the lever may be changed around to any desired position, which is often a decided advantage.

The large wearing surface upon top of the segment coupled with that of the upright journal forms a very strong and durable support for the end of the lever. The cam or star wheel for revolving the turret is made of solid steel so that there is no trouble from the teeth working loose and coming off. The bearing for the turret is formed by a taper journal of steel ground to a fit as usual, and is made solid with the star wheel, and hardened. The tripping, locking and shifting devices are of steel, and very simple.

The locking device is provided with gibs, and has tapered fits for taking up all lost motion when it appears.

The turret slide may be readily held in any desired position by one set screw.

The cutting-off attachment is adjusted by a screw placed in the center of the machine, which is adjusted by means of a hand wheel shown under the end of spindle.

Where the screw takes hold of the cut off rest it is covered to protect it from the chips and dirt. The slide is operated by means of a toothed segment attached to a handle and gearing with a rack on the under side of the slide. The gauge screws for cutting off have friction attachments which are free from the objections to jam nuts, and are thoroughly reliable under all circumstances.

There is no gib upon the slide but a side plate is surfaced to a fit and may be tightened at any time by scraping.

Small shelves are attached to the bed for the reception of gauges and tools.

A new friction clutch is used upon the counter shaft of this machine, which is sure and powerful in its action, at the same time simple in construction and has large wearing surfaces, therefore is but little liable to get out of order.

These screw machines are being introduced by E. P. Bullard, 14 Dey st., New York.

The Mechanical Engineering Section of the Franklin Institute, Philadelphia, has decided to choose and recommend a national standard system of gear teeth, by which all cut teeth of the same pitch and character will mesh correctly together, no matter what the diameter of the wheel.

With this object in view, makers and users of gearing are invited to offer suggestions as to form of teeth, progression of pitches, &c., for the most practical national standard. The Institute would also like to receive from gear makers tracings of teeth for 20 to 100-toothed wheels, two inch pitch, with centers and radii of curves, &c., plainly marked.

Notes on Machine Tool Construction.

FROM "AN ESSAY ON MODERN MACHINE TOOLS," BY JOHN RICHARDS.

It is hard to realize, with the perfection we now see in machine tools, that there are men yet living, and working, who assisted in making the first planing, slotting and other standard machines.

It is a common thing in England to meet old workmen who learned their trade in the works of Roberts, Maudslay, Clement, Bodmer or Nasmyth.

Bodmer, who invented more that has continued in use than any one among the original tool makers, completed his principal machines after 1840. Whitworth, who added much, is still living, and Fairbairn has only passed away.

It was the writer's privilege, a short time since, to go over the old works of James Watt, at Soho, where tools that he planned and erected seventy years ago, are at work alongside the latest designs from Manchester.

The first large engine lathe provided with a slide rest, and the details required for various kinds of work, was made by Maudslay, and is yet in use at his works in London. Roberts' first planing mill is at the Kensington museum, but might be in the shop, as it is by no means an inferior implement.

This country is the only place where there has been much variation from English practice in machine tool making. In all European countries the Manchester designs are closely followed, and three fourths, or more, of all the tools made in the world are of this type.

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During twenty years past the methods of turning and planing have wholly changed in Europe. Pointed tools, files and emery have given place to broad tools, rapid feed, water cutting and scraped surfaces; the latter scraped by hand when not finished in the machine. The saving thus effected is very great, not only in time, but in files, emery, and the care of tools. The work is more true, and surfaces better adapted for wearing.

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Box framing for machine tools has added a great deal to their strength and appearance also, at the same time, saving metal. The difference in the rigidity between a box and rib section is something which cannot be realized, except by experiment.

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In England planing machines form a strong contrast to the other tools. They remain nearly the same as they were made at first. No improvement to speak of has been made. The gearing is driven by one band, on pulleys not more than half the diameter of those employed in this country; consequently, the bands have to be wide, difficult to shift, and are passed over an idle pulley, so the shifting distance is two widths of the bands.

The difference in speed between the forward and back motions is gained by a sleeve and train of wheels, as it was in this country twenty years ago.

The platens are driven by pinions, usually of small diameter, and, unless extremely heavy, are apt to lift when heavy cutting is done.

Considering the improvements made in other kinds of machine tools, English planing machines are an anomaly. For heavy plain work they do very well, but for small, precise work they are far inferior to American machines.

The improvements made in planing machines in this country have been as follows:

1. Placing a large intermediate wheel between the pinion and rack, to avoid rubbing and lifting action.

2. The employment of two hands instead of one to avoid gearing, and permit the forward and back motion to be regulated at pleasure.

3. Narrow bands moving at a high speed, so they can be shifted with precision, and quickly.

4. Operating the feed motion from the driving gearing, instead of by tappets on the platen.

5. Differential shifting gear that moves one band at a time, and prevents the "screeching" always heard on European machines.

6. Arranging band-shifting devices, so a machine can be stopped or started independent of overhead shafts.

These improvements are all of importance, and contribute to the efficiency of machines, both as to the saving of time and the quality of work done.

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In Europe there has been of late years a gradual abandonment of common planing machines in the heavier kinds of work.

Moving the work on a running platen has a limit of adaptation. A large planing machine of this kind is generally an unprofitable investment—clumsy, expensive, and seldom in use.

When work becomes many times as heavy as the implements required to cut it, there are good reasons for moving the tools instead of the piece. This principle is traceable through all machine-tool practice of our day, but is especially marked in the case of planing appliances. Mammoth machines, with running platens to plane eight, ten or twelve feet square, are now seldom made, except in this country.

Four feet square may be called an economic limit for running platen machines. Work larger than this seldom has more than spots to be planed, and most any skilled tool maker will find a way to plane such pieces with one-fourth the expense of a huge planing machine. The matter has been overdone, and it is to be questioned if machines of more than six feet capacity do enough cutting each year to pay interest on their cost.

A large sole plate, with portable tools for planing and boring, is, in most cases, all that is required.

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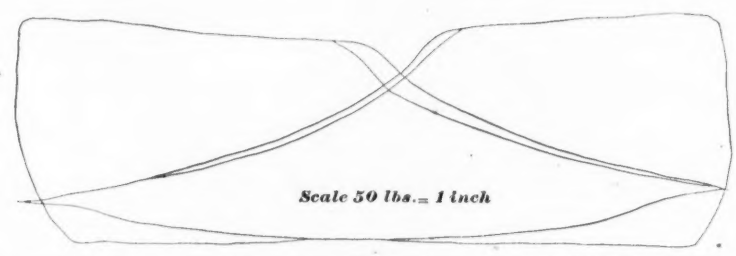
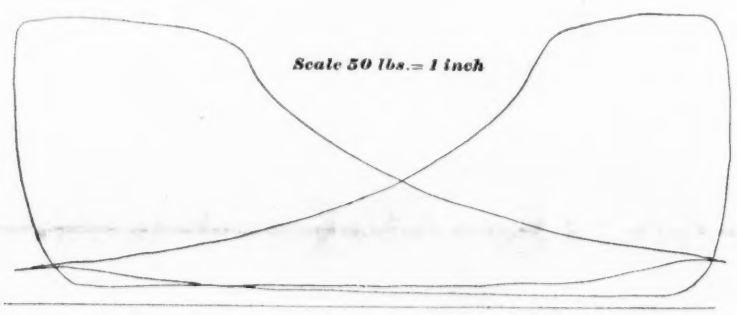
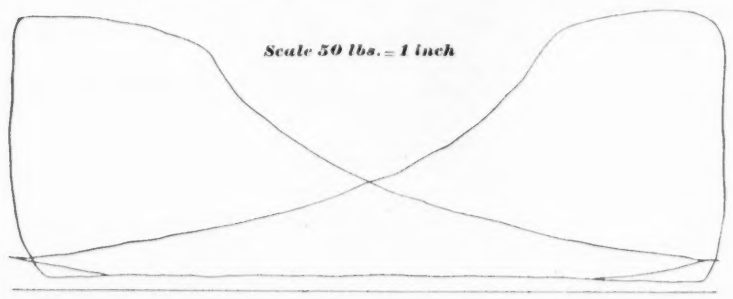
Screws give a smooth and perfect motion in planing, and for the heaviest cutting, such as "edging" plates, are better than a rack motion. The objection which seems to have prevented a more extended use of screws has been the wear of the nuts. This is not to be wondered at, however, when they are usually made of soft metal and only one used. There is no reason why several nuts cannot be employed. The shorter such nuts are made the better. This remark is true of all screw nuts subjected to strain, because







the tendency is to lengthen the pitch of the screw and shorten that of the nut. A long nut on a screw press soon "sticks fast."

The frames of planing machines require more rigidity than in the case of any other machine tool. The patents being inflexible, or nearly so, the least deviation in the main frame causes an unequal bearing on the ways. Such frames should, whenever possible, be made of a box section, so as to resist torsion. The common method of having two side rails with cross girts is one of the weakest forms that can be adopted. A frame of this kind, whether for a planing mill or lathe, is easily "twisted," no matter how heavy it may be. When a foundation is depended upon and the machine frame is not mounted on "legs," a rib frame is not open to the objection named; but in all cases, when a machine frame stands on legs, the frame should be as nearly inflexible as it can be made, and rest on as few points as possible. Three are better than more. In fact, three bearings for frames of any kind is the best method of keeping them true and avoiding strains. A central support to sustain weight is no objection, but such supports should have a small bearing at either the top or bottom.

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Engine lathes have the chief place among machine tools. The ruling form in machinery is cylindrical, and the chief operations in finishing are performed on lathes or other rotary machines. The diversity of purposes a common lathe can be applied to is marvelous—turning, boring, drilling, milling, screw and wheel cutting, are all among lathe functions and can be performed with but little change or adaptation. Considering the important place filled by engine lathes, it will seem a bold claim to assert that they are less perfected than other standard machine tools, but this is certainly true. Planing, slotting, drilling, milling and other machines are made with more strength, better adaptation, and are more apt to suit those who purchase and use them.

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The width of a frame is not often thought of as a matter affecting the convenience of a lathe, but it has become so, in a serious degree, for those exceeding 30 inches capacity. The conditions demand that a workman can bring his face near to a tool in order to see its action. In boring his head must pass beyond the center of a lathe in order to inspect tools. In the smaller class of work he is continually placing and removing pieces, so that access to a lathe is a matter of no little importance.

In some modern lathes, even of the better class, the frames are as wide as the diameter that can be turned, and added to this is the apron, which, to hold its various complicated details, must be from five to ten inches deep, so that a man standing on the floor can not get near the tool. This is a result mainly due to rib frames, because in a lathe having a box frame, the transverse dimensions of which will be equal to one-half the lathe is to turn, will be found sufficiently rigid and will stand as before said more torsional strain than an open one twice the size. Considering the merits of box framing for all machine tools that have to resist heavy strains, it is strange the method has not sooner been adopted.

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The taste, or want of taste rather, that leads to ornamenting the framing of machines in this country has done much to disparage American skill, and in many cases prevents the sale of export orders which the working qualities of the machines would otherwise command.

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The expense of fitting a carriage so as to have a positive movement is twice as much as to mount it on angular ways and depend on gravity or springs to keep it down. This is a matter of some obscurity, and it has, to many, been a problem why so many lathes were made with angular carriage guides. It is a question of expense. A carriage mounted on the top and edges of a frame must be well fitted; there is no chance for emery grinding. For face work, heavy cutting, or boring, and such work as is done on the Pacific Coast, no method is so good as to gib a carriage over the edge of a frame, allowing ample wearing surface at all points. It is sometimes claimed that carriages having a positive fit will wear loose at places where they are most used. The same thing is true of the angular ways, and in a much greater degree, only that in light work such wear is sensible in one case and not in the other.

For general purposes, a lathe carriage should be so made that it can be at once "stripped" and left free for boring, drilling or other purposes. A swivel tool rest that can be moved to any part, is much better than a traverse block which cannot be taken off without trouble.

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The marvelous ingenuity displayed in contriving feeding devices for engine lathes has not improved them proportionately. The apron gearing of a common lathe contains as much detail as a calender clock, and there seems to be a studied effort to hide the parts and render them inaccessible.

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For ordinary cases, and considering the complication of what is called a rod feed, it is doubtful if much is gained over having a good screw motion for all purposes. If a screw is large enough, has a long nut made of hard material, it will last much longer than one of the complicated aprons and cause no detention for "repairs." Such a screw, made reversible, so it can be changed, end for end, if worn in one part, will last for a dozen years under severe duty; and the performance of a lathe arranged in this way will generally be equal to those that are more elaborate.

Rack feed can, however, be made durable and strong, and has the advantage of starting at any point without delay.

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There are far too few face lathes employed in machine shops. Except for very large work, they are rarely seen.

A long frame is seldom used for lathes of large capacity, and a shifting tail stock is generally in the way. Pieces of large diameter are always short, and there is much gained by having clear access to their front. A man cannot well stand on the carriage of a lathe unless it is a large one, and unless he does the frame and tail stock are in the way. The principal difference, however, between face lathes and those on long frames is in their cost. For example, a face lathe to turn 6 feet, with compound rest and self-acting feed in all directions—a portable or movable head, for boring and supporting mandrels, will cost about one-half as much as a common lathe of equal size. For jobbing and general purposes, where the work is often changed, a face lathe will do more work, and, as before remarked, is easier to operate.

Making lathes of large capacity on the same model as small ones, is like large planing machines, and the same remarks will apply in the two cases. If a face lathe is properly arranged, so as to receive strong, stiff stud mandrels, work can be mounted in less time, and even small pulleys can be turned as fast and as well as on small lathes.

There are many hints about tools to be gathered from the constancy with which they are kept at work. A large planing machine or a large lathe, on a long frame, are generally among those tools out of use.

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The tendency with boring tools is the same as in planing or other processes, that of adjusting tools to the work instead of moving work to the tools. What is called a horizontal boring machine in this country has for some time been going out of use in England. It is an expensive machine that will bore but one hole at a time, and so arranged that the work must be moved for adjustment. At least one-half of the machine is devoted to holding and feeding the bars, and so important this seems, that pieces, no matter how heavy, must be moved up, down or transversely each time a hole is to be bored. The latest and best adaptation of boring appliances is to have a large solid plate or box covered with bolt ways, so work can be fastened at any part and in any position; the boring spindles driven and fed by independent "heads," that can be fastened in any position, and can be of different sizes, to suit the size of bars used. The heads can be carried anywhere, and can be used on large or small frames, as the work requires.

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For accurate boring, a traveling carriage, as in the case of a lathe, is sometimes better than a bar with longitudinal feed, but the distinction between the two operations is so obscure, that few workmen understand it. Feeding bars, when properly mounted, will bore ordinary holes true enough, and this is all that is required, except for steam or water joints.

Light work that can be easily adjusted, may be done on drilling machines quite as well as by horizontal boring machines, and the next tool in succession should be one where the bars can be adjusted, and several used at once if required.

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Test of a Steam Generator.

The following is a summary of a test of Bate's steam generator, which was described in full in the AMERICAN MACHINIST of Feb. 12, 1881. The test was made by A. Wilkinson, M. E., upon two of Bate's duplex boilers in use for the past three years.

The test was begun at 6.45 A. M., and concluded at 6 P. M., running the entire day, or 10¼ hours. Preparations were previously made for conducting this test with every degree of accuracy. A tank located in the upper story of mill was filled with water from the street mains, which in turn was connected to a steam pump delivering water

to the boilers through a coil heater at 185° Fahr. The water level was duly noted and marked. The indicator was applied to the engine, and cards taken periodically throughout the entire day, showing an average of 166.7 indicated horse power. The engine was of the Corliss type, built some twenty years ago, and was found in a reasonably fair working condition. The coal used is known as "Schuylkill pea," and was carefully weighed, amounting in total to 4,476 pounds for the entire run. Weight of water was determined by measurement, and computed at 62.5 pounds per cubic foot, making a total of 50,778 pounds, which, divided by 30 pounds, the factor of horse power, shows a duty of 168.5 indicated horse power. This, divided by number of pounds of coal, shows an evaporation of 11.34 pounds of water per pound of coal consumed.

The lower Boiler 60 inches in diameter, and 16 feet long, containing 51 tubes, 4 inches in diameter, and in lower section, 32 tubes, 4 inches in diameter, and 5 feet long. The lower boilers are connected to the upper boiler, or steam drum, 42 inches in diameter by 17 feet long, by 3 necks, 12 inches in diameter, making a total heating surface of 1301 square feet. The furnace bars measure 33 square feet under each boiler. Diameter of Cylinder, 20½ × 48 ins.

Revolutions per minute..	53
Speed of piston in feet per minute.....	428
Factor of horse power due area and velocity.....	4.28
Boiler pressure (average).....	75 lbs.
I. H. P. maximum.....	183 7
" " " minimum.....	149.8
" " " average.....	166 7
Coal consumed per hour per I. H. P.....	3.1
Lbs. of water total	50.778
" " coal "	4.476
Evaporation per 1 lb. of coal.....	11.34

It will be evidenced by the close proximity of horse power of boiler and engine, that the steam furnished by these boilers was comparatively "dry," more especially so when the horse power of engine and weight of water are placed in juxtaposition and so considered.

The three accompanying cuts show the average duty. Using the terminal pressure in these diagrams, as a measure of steam consumption, Mr. Wilkinson finds the same to be 26.5 pounds per hour per indicated horse power, or 47,482 pounds for the entire run showing a loss of 6.5 per cent. by condensation, etc., in cylinder and pipes.

Straw Burning Portable Engine.

In many parts of the grain-producing West, the fuel problem is one of great importance. Vast stretches of country are entirely treeless, and coal is not to be had except at such prices as place its use substantially out of the question. In this section, however, straw which in the Middle and Eastern States is valuable, is practically worthless.

It has been demonstrated by experiment that a ton of straw, if burned in a properly constructed furnace, is fully equivalent to one-half ton of coal, so that it is only necessary to consider the mechanical construction of the boiler, with reference to the peculiarities of straw as a fuel, to afford a solution to the fuel problem, so far as the Northwestern agriculturalist is concerned.

We present with this engravings of a straw burning portable engine and boiler, built by Russell & Co., of Massillon, Ohio., which seems to be well adapted for the purpose. These engines are made in various sizes to suit different requirements. The general construction of the engine is not materially different from other well-constructed engines of the class, the chief difference being in the construction of the boiler, for which reference may be had to the details as illustrated.

It will be seen that the shell contains fire and return flues, the gases passing from the fire box to the other end of the boiler through one set of flues, and returning through another set where the unconsumed portion enters the smoke stack. In the end of the boiler remote from the fire box is a second combustion chamber, in which is placed a fire brick deflector plate. This plate serves not only the purpose of deflecting by an easy and natural turn the hot current from the fire flues into the return flues, but what is of more importance, being kept at a red heat by the impinging gases from the fire tubes, it furnishes at all times the heat necessary to rekindle any gases that may have been quenched in their passage through the fire tubes. The air necessary for the combustion in this chamber is furnished by proper openings.

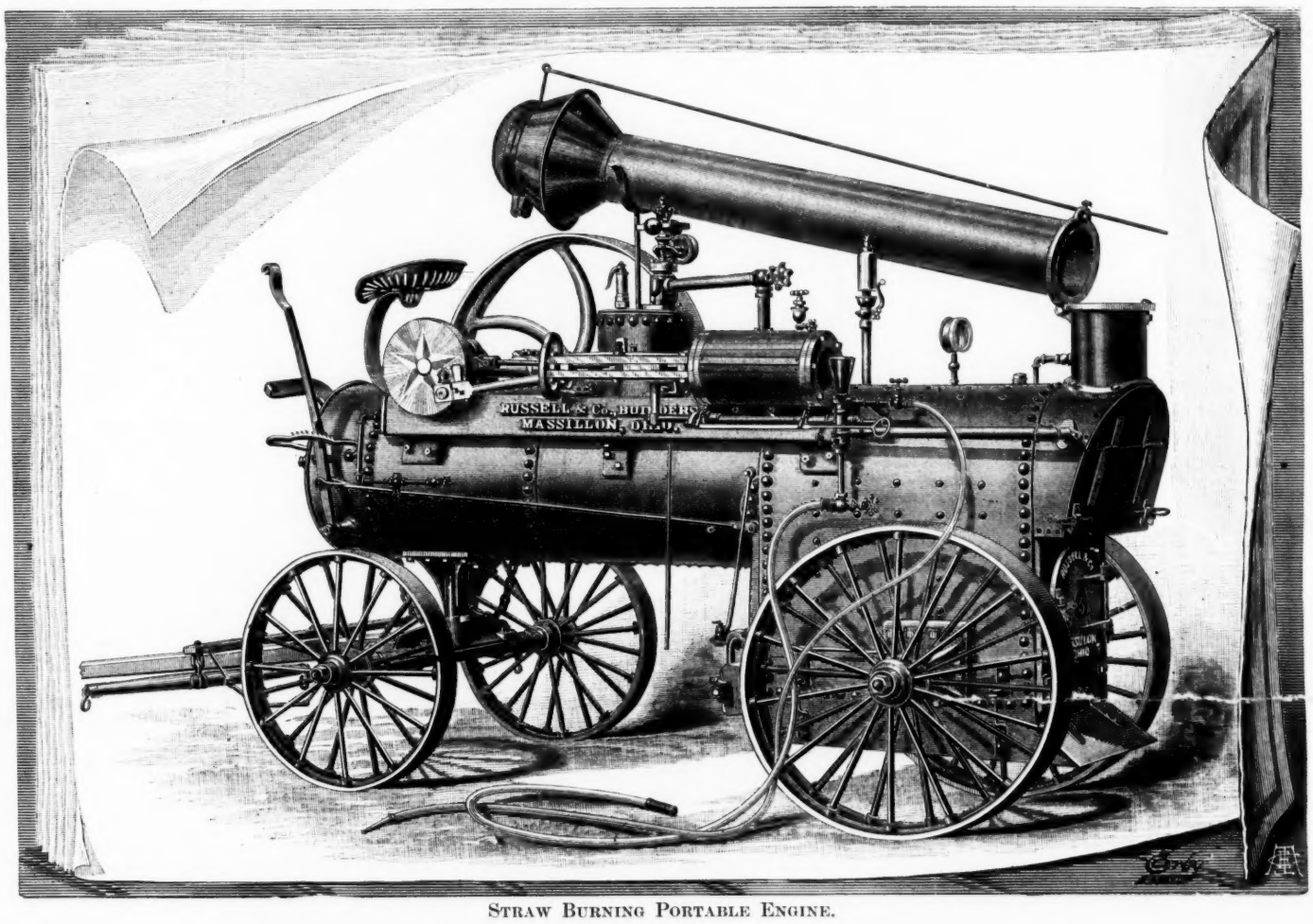
By means of the long run and the arrangement of combustion chamber, the combustion is as nearly perfect as in the case of other fuel.

The steam is taken through a dry pipe, and the boiler is completely lagged—two recent improvements not shown in the perspective view.

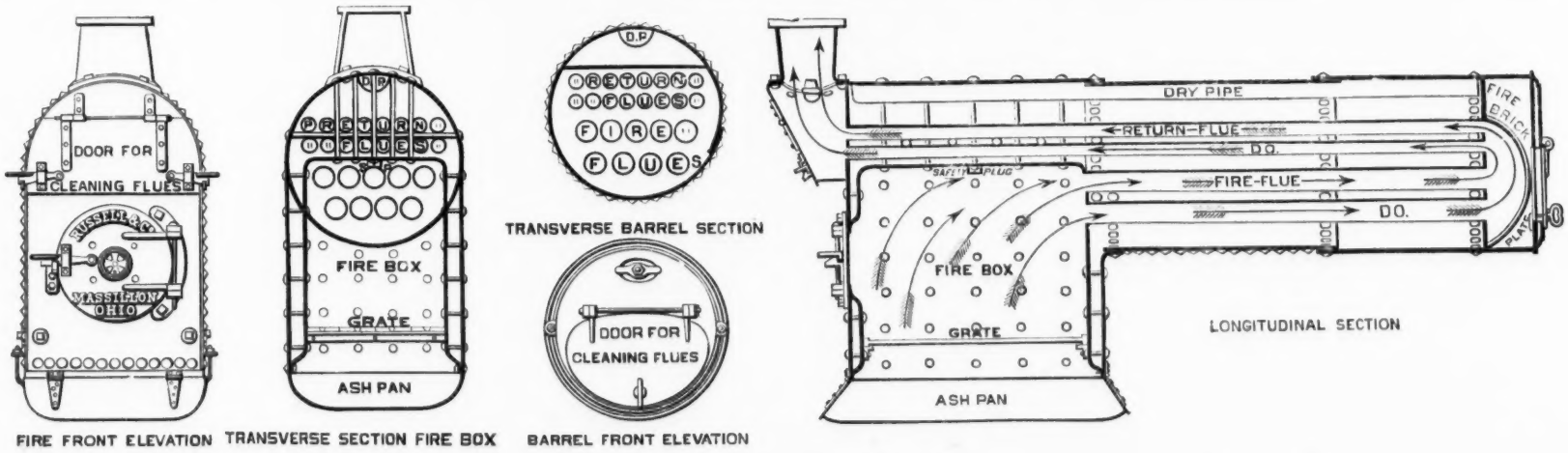
Although these boilers are designed especially with reference to the use of straw as a fuel, yet in raising steam to start, or at other times, if advisable, other fuel may be used to advantage. In order to fit them permanently for the use of other fuel, it is only necessary to change the grate.

These boilers are made, we are informed, of the best material, thoroughly stayed, and are rigidly inspected in all their parts before being passed.

The features of the running gear and other parts of the engine, together with the convenient arrangement of the details and appliances, may be seen in the engraving.



Straw Burning Portable Engine.



FIRE FRONT ELEVATION TRANSVERSE SECTION FIRE BOX BARREL FRONT ELEVATION

The Western Union Telegraph Company, since their recent gobble of the latest rival company, are evidently trying to earn (?) a little more money with which to pay dividends on their watered stock, and have adopted a new dodge. Recently, desiring to send a telegram from this city to Brooklyn, a friend of ours was invited by the liberal corporation to pay *ten cents* car fare additional for carrying the message *four blocks*. Our friend sent his message by boy, and saved considerable time and *thirteen cents* by the operation.

John Miller bought a planing mill at Dunkirk, Ohio, a month ago. He lost a finger the first week, two fingers the second, and a whole hand the third. The mill is now for sale.—*N. Y. Sun.*

The objectionable dark coating, says the *English Mechanic and World of Science* which most bronze statues soon acquire, with the look of cast iron, does not consist of sulphurate of copper as commonly supposed, but of a mixture of foreign matter with oxides of the bronze metals. This cannot be removed mechanically, or by dilute sulphuric acid, but yields readily to treatment with a concentrated solution of carbonated ammonia, applied with a brush.

The plumbers of St. Louis, becoming tired of living in plain stone-front houses, have struck for higher wages and carried their point. Now they will live like Chicago plumbers, in marble fronts on the boulevards.—*Southern Manufacturer and Builder.*

Gordon, who some years ago was the great printing press manufacturer, distanced all competition, and made, it is said, over $600,000 within six or eight years. On one occasion he was traveling by rail, and occupied a seat by the side of one of his competitors. Said the latter individual: "Gordon, we have been borrowing your devices, some of them patented, and using them in our presses. I think we ought to pay you something for the privilege." "Don't mention it," said Gordon; "if you begin to pay royalties, you will search for ways to avoid such payments, and will bring out new improvements. I don't want any royalty. Go right along with your copying."

Improved Upright Drill.

The accompanying engraving represents an upright drilling machine built by W. F. & John Barnes, Rockford, Ill., which possesses some features in the way of improvements worthy of notice and upon which we are informed patents are now pending. The design and patterns were made by this company for the purpose of furnishing themselves with machines for use in their works, since doing which they have concluded to commence their regular manufacture for the trade.

The table or platen turns in the supporting arm, which may be swung around the post and out from under the spindle when desired. It is raised and lowered by means of a screw, the handle of which is situated so as to be easily reached by the operator when in his natural position. The platen as well as the arm is clamped by clamping screws having attached levers, which renders the operation quick, and saves time spent in looking for wrenches.

The spindle which is made of cast steel is counterbalanced by means of a weight in the hollow column. It is fitted with the Morse twist drill taper, and is fed with a lever feed, a quick return motion being provided for by a second lever.

The shipper is so located and arranged that the operator uses his foot for stopping and starting, thereby keeping his hands at liberty to handle the work.

The cones have four changes for belt, all gearing and racks are cut, the bearings are long, and throughout the intention to make a good tool seems to have been carried out.

Building a Foundry.

BY THOMAS D. WEST.

When a man is about to construct a foundry, he cannot give the matter too close attention. Let him make lines and rub them out again until he gets something that fills his ideas; then make three or four tracings, and submit them to as many different practical foundrymen, with the request that they find all the fault with them they possibly can. Let these men examine the drawings with great care, and present their opinions—especially their objections—in writing. Then, with a mind unprejudiced, let him consider their opinions, and adopt whatever is good.

The idea that should be prominent is that the plan of a foundry should be decided upon from a consideration of the particular class of work for which it is to be used, and other controlling circumstances, such as the general character of the land, the position of a railroad, river, lakes, streets, etc., etc.

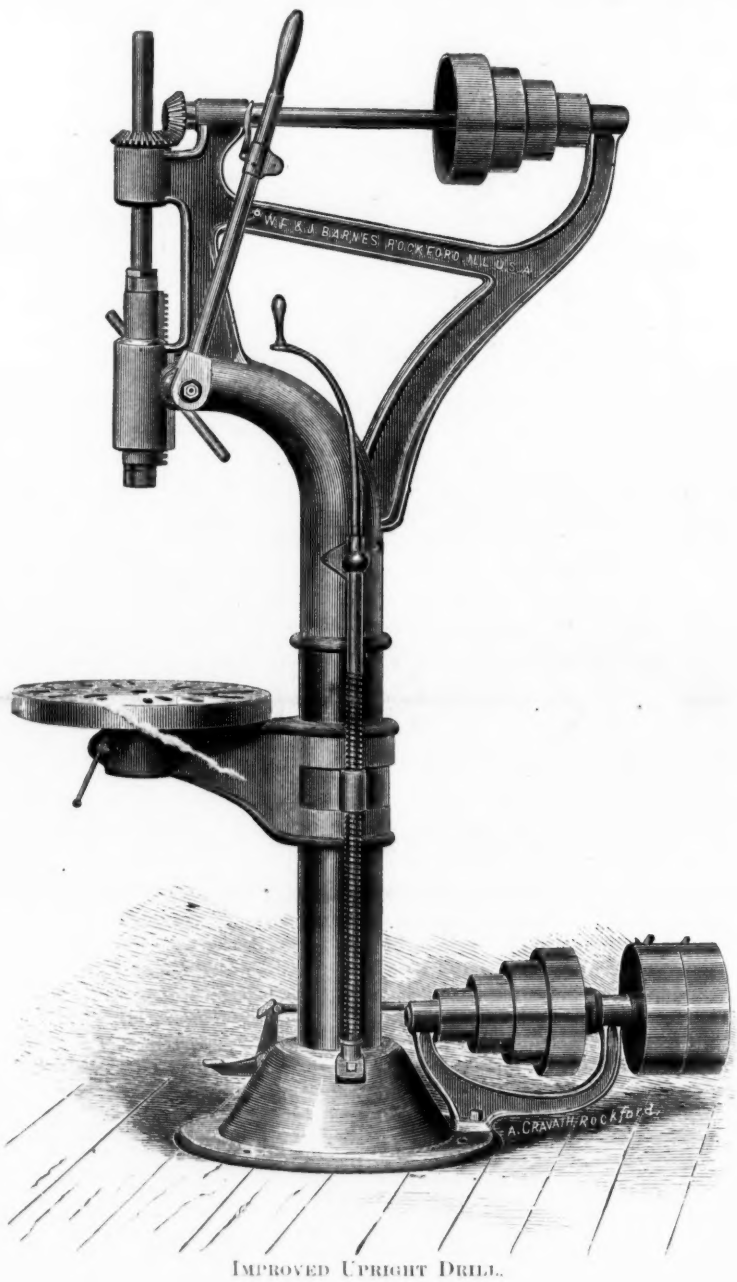
To attempt to show a plan for the construction of a foundry that should be of anything like general use in building would be foolish, since scarcely any two foundries ought to be built alike. The fact that there are so many unhandy foundries is not always evidence that the designer was in fault; since, considering the location of other buildings, and circumstances over which he had no control, he may have done the best that could have been done.

There is one thing, however, builders or designers are greatly to be blamed for, and that is for not providing for enlargement.

If there is not much business or capital to start with, the small shop, having only one cupola, one crane, one pit and one oven, is not the building that should be made on paper. The proprietor or designer should take into consideration his available ground room, and then make a drawing or plan as if he were going to build the largest shop that could possibly be constructed on the grounds. If there is room for three or four cupolas, a couple of air furnaces, five or six cranes, a number of different-sized pits, and several good ovens, let them all be carefully located on the large plan or drawings. When the drawing is completed, let him consider what portion of his large shop would be the best and cheapest for him to construct, with the capital he can afford to invest in his enterprise to start with. Then, when his business increases, and he wants another crane, cupola, pit or oven, he will only have to look at his original drawings, and there are places for them. When he builds his shop larger, the builder can find studdings, bolts or broken brick work to securely fasten the extension to.

It is not intended that the reader shall take the word "extension" to mean the usual kind of extensions that are added to foundries, such as "dog houses," "pigeon holes," etc., and which, wherever seen attached to the main shop, are sure signs that extension was never thought of, or provided for, when the main building was first planned.

There is no intention in this to show how to build fine, large shops, but rather to show to the man of small capital that before he starts to lay out his money he may, to a great extent, by careful study and management, make his little enterprise a running success. Many a man has failed for want of judgment in the beginning.



IMPROVED UPRIGHT DRILL.

There are two things that are connected with every enterprise. One is the advantage and the other the disadvantage. When a man does not see *both*, it is evidence that he has not deeply investigated the subject. A man who takes every element and business point separately, and thoroughly dissects them, not only can know what is best for him to do, but will be inspired with such confidence and energy that the word "failure" would have to be printed in larger type than is yet used for him to see it.

In building a foundry, the shop should be built high. The medium height for shops that do crane work is about twenty feet. This measurement is from the floor to the large girders, or beams, that the top of the crane is held by. In fact, any foundry should be built high, so as to give plenty of space for the gas, smoke and steam (which is always generated at casting time) to raise up over the men's heads. To carry hot iron through a dense fog of gas, smoke and steam is a duty that is not only unpleasant, but has been the means of many workmen getting badly burned.

The next point, and one of great importance, is to have the shop constructed so that plenty of light will be admitted from the roof, as well as from the sides. A dark foundry is not only disagreeable to work in, but is the cause of many rough and poor castings. It is also a great drawback in getting out work fast.

A foundry that is built for large, heavy work cannot be too strong. The doors, or openings, through which the large castings are delivered, should not be less than fourteen feet wide and ten feet high. It is best to have the doors hung by weights, so they will slide up and down. Doors that open out or in, or that run backward and forward on sheaves, are always more or less in the way. Doors, when it is possible, should be placed in a part of the shop so that when opened the dust cannot be blown on the moulder or his mould, as it is not only disagreeable but it hinders him from doing his work.

Cupolas should be built in that part of the shop in which the large doors are situated, as generally this part of a shop is only used for a road or gangway. Placing doors and cupolas near together utilizes room, as the room for several feet around a cupola is not used for moulding. This plan also keeps the dirt and dust from the doors and cupola together, and the moulding room, destroyed for one, will answer the purpose of the other.

Loam and dry sand moulding should be kept in a part of the shop distinct and away from the green sand floors or moulding room, as the dirt and mess that pieces of brick, mud, straw, cinders, etc., make are very disagreeable, and a hindrance to the green sand moulder. The best part of the shop for loam and dry sand work is at one end, and near the ovens.

The ovens should be located in the part of the shop where there is not much traveling done, either by cranes and cartage or foot travel; also where the railway tracks that the oven carriages run in and out on, will take up the least valuable room.

Large and small pits for casting, or ramming up moulds in, should be as handy and as near as possible to the loam work.

When air furnaces are required, they should be located as near as they can be to the loam work, and where there will be nothing in the way of delivering heavy or large scrap iron to charge them up with. They should be built up enough above the level of the foundry floor so that the tapping hole will be from 3 to 4 feet above the floor, in order to admit the pouring of moulds direct from the furnace, or to have the liquid iron first run into a large basin, from which it is admitted into the mould.

Every well-regulated foundry should have good facilities for cleaning castings, which when possible should be cleaned in an adjoining room, so that the moulders will not be hindered from their work, by waiting for a crane, looking out for flying iron chippings, and giving orders for hoisting and lowering the crane, that cannot be heard on account of the noise.

A narrow or wide track can be laid between the casting and cleaning shops, and as soon as the heavy castings are hoisted out of their moulds, they can be loaded on a car and run into the cleaning department, in which there should be a crane for handling them. In the cleaning room there can be tumbling barrels and vitriol tubs for the cleaning of small castings.

Shops that do heavy and light work should have the light work done in parts of the shop entirely separated from the heavy floors; for the reason that grades of sand better adapted for each class of work can then be used and the work done to pay better. The portion of the building to be used for the moulding of heavy castings should be constructed with a view to strength, while the portion for the light castings can be constructed more cheaply.

In selecting ground to build on, there should be three or four wells or holes dug to see if it is subject to dampness or water. Should there be water found at the depth of six to eight feet, the position should be rejected, that is if the foundry is to be constructed for a heavy line of casting that will require bedding in the floor, or should pits be required.

When planning a shop there should be plenty of time taken before it is let pass into the builder's hand for construction. Hasty planning is likely to be sooner or later regretted.

Machine Tool Economy.

A good workman receives in wages from $800 to $1,000 a year, occupies, on an average, 100 feet of floor room, and requires an investment of $1,000 or more.

The product of his work is from two to three times as much as his wages. The average value of machine tools required for each workman is $500. Interest and depreciation on this amount will be $50 a year. The proportion between the cost of tools and wages is nearly as ten to one.

If the efficiency of machine tools is increased one-fourth, the result is equal to a proportionate reduction of wages, or from $200 to $250 a year for each workman.

One hundred dollars spent in judicious tool improvement will amount to $10 a year as an investment, and may save $1,000 in wages.

It is not the first cost of tools that enhances the expense of production; it is extra labor caused by the want of good tools.—*From Catalogue of the San Francisco Tool Co.*

The waste steam generated by the Corliss engine, at Pullman, is now utilized, and is connected with a machine in the cellar of dwellings; and the citizens, using this device for heating, will be charged a fixed rate per annum. This system is found to work well in houses distant half a mile from the engine. Gas is used largely for fuel in that city, and in many of the dwellings, including the Hotel Florence, cooking is done entirely by its aid.—*Industrial World.*

Fluxes for Soldering or Welding.

For Iron or Steel.—Borax or sal-ammoniac.

For Tinned Iron.—Resin or chloride of zinc.

For Copper or Brass.—Sal-ammoniac or chloride of zinc.

For Zinc.—Chloride of zinc.

For Lead.—Tallow or resin.

For Lead and Tin Pipes.—Resin and sweet oil.

New Four-foot Planer.

We herewith illustrate a new iron planer brought out by the Hendey Machine Co., Torrington, Conn. This is what is styled a friction planer, the belts not shifting as in the ordinary planing machine. This feature brings about a saving in belts and power; also an accuracy of stroke that cannot obtain where the belt or belts have to be shifted. The table will reverse inside of three-fourths of an inch, and has quick return motion.

This machine is very strong and heavy in all its parts, and the sliding surfaces are accurately fitted by scraping. The racks and gears are all cut from solid metal.

All nuts, wrenches, screws, &c., are case-hardened; the feed screws are steel, square threaded; the holes in table drilled and reamed and the slots planed.

The feeds—horizontal, vertical and angular—are automatic.

This planer planes 4 feet long and 16 inches high and wide. Weight 2,000 pounds.

Concord, N. H., votes to hold a fair for agricultural and mechanical exhibits next fall, and to offer premiums of $3,000 or $4,000.

Proprietors of machine shops who do not furnish proper accommodations for their men to wash the grease and dirt from their hands, should be reminded of the fact that their oil will get wasted and their waste will get oiled.

The Medical Officer of Health and the Chairman of the Health Sub-Committee, of Birmingham, England, were deputed to attend the recent Smoke Abatement Exhibition in London. Their report concludes as follows:

For the prevention of smoke from domestic grates the variety of contrivances is endless, and positively bewildering. A great many of them—by far the majority—may be put aside as much too fanciful for general use; but from a careful inspection of the general display the following conditions may be laid down as those which will secure smokeless fires:

1. The consumption of gas only as fuel.
2. The consumption of coke alone, or mixed with gas.
3. The combustion of anthracite coal.
4. The combustion of bituminous coal in specially-constructed grates.

The objection to the first is that most of the arrangements for burning gas as fuel have, till quite lately, been too costly for general use, most of the heat having been allowed to go to waste. There would be no difficulty in selecting from the exhibition examples of arrangements by which the whole, or very nearly the whole, of the heat which can be derived from burning gas is used, and at a cost not greater than that of a coal fire, especially when the trouble and dirt of the latter are placed in the account. To use the words of Sir Frederick Bramwell, "We like a pokeable, companionable fire," and therefore gas fires are not popular. The combustion of gas and coke, as suggested by Dr Siemens, supplies this want, and is absolutely smokeless. The burning of anthracite has been long known to be smokeless, but has been a matter of difficulty. There are many arrangements on view at the exhibition which overcome the difficulty, and the fire-clay grate of M. Perrett seems to us to merit special attention. The amount of heat given off by this fireplace is positively astonishing. There is an utter absence of smoke, and this without the use of any mechanical appliance whatever. Finally, there are grates so constructed as to render possible the burning of common coal without the production of smoke and with increased heat.

An Engineer for Two Hours.

BY A TRAVELING ENGINEER.

Jones, Smith & Co. were extensive manufacturers, who owned and operated a mill in one of the interior towns of this State. Jones & Smith were capitalists, and resided in New York; while Robinson, the company, lived near by, and superintended its operations.

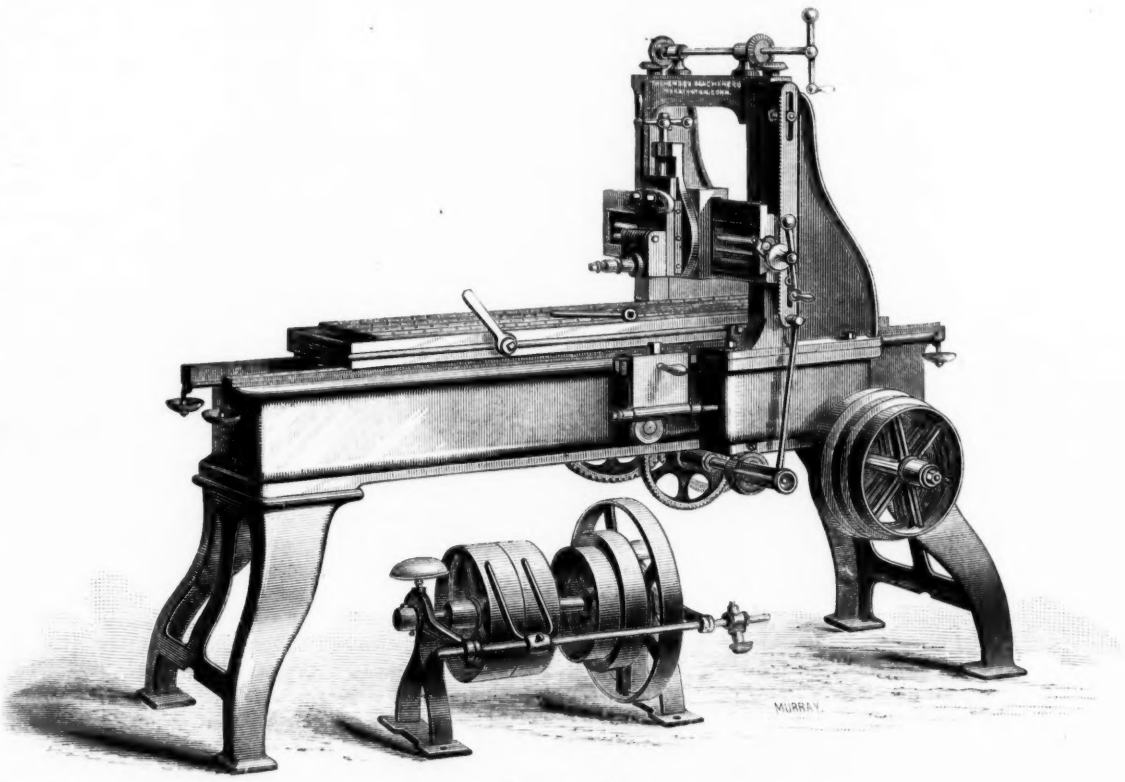
The mill, a very modest affair when first constructed, had been furnished with two boilers and an engine of sufficient power for the work they contemplated doing. The needs of their business required additional buildings and machinery from time to time, and at the period of our writing the aggregate horse power required was more than double that used when the mill first started.

The boilers, the engineer said, had been used twelve years when he took charge of them fifteen years ago, and now he began to have fears of their safety with the high steam pressure required to do their work, and he often spoke to Mr. Robinson, recommending him to buy new boilers, or at least to have the old ones thoroughly examined and repaired, if they were worth it. The general reply was, "We must run along awhile yet; can't stop now We'll think of it. They are good enough for the short time we shall use them." Next year, when business slackened up, Greaser, the engineer, spoke again about new boilers and engine, and what a capital time it would be to make the change, while the mill could be idle without loss. But Jones & Smith thought the outlook for business was very bad, and perhaps they might never need the factory again; anyway, they were opposed to spending so much money just then, when so little was coming in.

In the following fall business began to boom, and at the mill they were very soon head and ears in work, demanding more and more power, and running overtime. Robinson said it was a pity they did not overhaul when they had a chance, but they could not help that now. It was no use crying over spilt milk. "Keep her going, Greaser, till we get another chance." And so the years came and went, and the old boilers steamed away, while the wheezy old engine appeared as though it might jump off its bed some day and walk out in disgust.

The faithful engineer, tired out trying to keep things together, and alarmed for his own safety and that of his fellow employes, had been talking about new engine and new boilers so much that he had been voted a nuisance by the firm. They thought he made more fuss than was necessary about what they regarded as a small matter.

About this time certain changes in the market required a new class of goods, and another line of shafting for some additional machinery was being added. Greaser said it was no use trying any longer—"might as well give up first as last." He was pacified again for a time. Having a large family and no other job offering, he concluded to try it awhile longer, but his conversation showed he was very much dissatisfied. When this was reported at the office, Smith thought they ought to look out for another man who was "not so full with old woman's notions." Jones said: "If we employ another regular engineer, he will be just as cranky as the one we have." He was not in favor of paying eighteen dollars a week to such a man for finding fault with their management. "They're all alike," said he; "better get one of our own men and train him for the business as we want it done. I'll ask Robinson if he can't find such a man." Of course, it never for a moment occurred to Jones that a man might be *trained* (that is, taught) all the firm knew about the duties of an engineer, and still be very lightly equipped.



NEW FOUR-FOOT PLANER

Robinson agreed with his partners, and thought he had just the man they wanted in the person of Jimmy, who at the time was driving an ox cart, hauling in coal and carrying away ashes. He had been about engine and fireroom a great deal, and had often been ordered to "lend a hand" in helping the engineer. Almost any one could be an engineer, he declared, who would keep the fires up and oil the engine.

Jimmy was approached and offered an increase of pay to twelve dollars a week if he thought he could run the engine. He thought he could if he watched around for a week or so. He was told to post himself that week and they would discharge the old engineer and give him the job Therefore Jimmy kept his eyes and ears open his level best that week, and at its close the engineer was called up, paid off and told that his services were not wanted there any longer, they had employed another man in his place. He complained that it was pretty short notice but obtained no satisfaction; therefore he picked up his tools and effects and started off home, feeling relieved at getting away from the old boilers but sad at the prospect of being out of work.

On Monday morning the new shaft was coupled on and Jimmy busied himself about the fires and engines feeling the importance of his new position. The Superintendent, or the "super," as he was more familiarly known, was in and out of the engine room several times to inquire how things were going. He got satisfactory replies from that quarter, and things certainly were *humming*. About 9 o'clock Robinson came to the mill, and meeting the "super" asked how Jimmy was getting along. "Everything is running finely," was the reply, "I never saw the shafting run faster. All our work is on. You can see for yourself." "Glad I made the change," said Robinson. "We did not get rid of that fellow any too soon. Those engineers are always wanting some foolish thing done. If we had satisfied him then, he would next have wanted the *boiler fronts nickel plated*." "Sure as you live he would," said the "super," immensely pleased at the joke. "Let us go round to the engine house," proposed Robinson.

They found that Jimmy had just finished firing one of the furnaces.

"Good morning, Jimmy; this is better than engineering the ox-cart, eh?" said Robinson, slyly winking to the "super."

"You're right, boss," was Jimmy's reply.

"Any trouble to keep steam?"

"Oh, no, it's as easy as rolling off a log."

"Attend to your business, and we'll do well by you," said the "super" by way of encouragement.

Meanwhile Robinson was looking very intently at the water gauge glass, and he commenced trying the gauge cocks.

Not finding signs of water with either, he called out, "Hey, Jimmy, where's your water?"

"I guess it's there. I didn't change it at all," Jimmy said.

"What! haven't you put on your pump this morning?"

"What's that? I don't know," was the bewildered reply of the whilom ox-cart manager.

"Haul your fires; the water's all out of the boilers," shouted Robinson, as he fled from the fire room, the "super" close at his heels. Poor Jimmy, thoroughly demoralized did not stop to haul any fires but took to his heels, too. Later in the day boilermakers pronounced the old boilers unfit to repair. Robinson sent a messenger after Greaser the former engineer, informing him his discharge was a mistake or a misunderstanding on the part of the "super." He'd better go right on repairing his engine and other machinery so as to be ready when the new boilers were in.

Several of Greaser's friends, engineers at other mills about the town, came around to his house that evening and all seemed greatly tickled at what he told them; how Jimmy fired up that morning on less than a gauge of water and following too literally the instructions of the firm—"keeping a good fire and oiling his engine"—had gone on blissfully ignorant, evaporating the water in the boilers and finally when dangerously low had overheated them so badly, they were to be taken out. His friends agreed with him it was a lucky escape from a bad boiler explosion, and that perhaps there might yet be a chance for experienced engineers who had learned their business the old way. From present indications it is not likely there will be another opening for a "*trained engineer*" in that neighborhood for some time to come.

International Railway Industrial Exhibition.

In 1884 will be held in the Prater, Vienna, an International Railway Industrial Exhibition. The exhibition, which will be held under the immediate patronage of M. de Pino, Minister of Commerce, will be similar to the one recently projected at Berlin, but which was abandoned, owing to the refusal of the Prussian Government to grant the necessary site.

Give the Boy a Chance.

BY THOMAS F. HAGERTY.

How many boys who, having chosen a trade and entered into their apprenticeship, have been doomed to remain inferior workmen, because of being denied a fair opportunity of developing the best that was in them, would be hard to estimate.

The young apprentice, if he is satisfied with the trade he has chosen, and has ambition to equal if not excel, some of his fellow apprentices, will naturally look for and expect to receive encouragement from some source. He looks up to the older apprentice, to the journeyman, to the superintendent, or to his employer, for advice, and in most instances receives a cold reply to his inquiries.

The best boys are generally the timid ones, the forward boy, in many cases, not being treated as kindly as the boy who seems to lack self-esteem. There is always a "spark of human kindness" extended to those who seem most dependent on others.

And in no place should this generous feeling be so liberally shown as in the machine shop; where the names of the tools and the nature and perplexing variety of the work to be done would puzzle the mind of a timid boy.

Therefore those having control of either men or boys should use civil and polite language in giving directions; keeping in mind the fact, that should the head get impatient and ill-tempered, every member will be affected in like manner. A boy should receive every encouragement and advice until he has sufficient self-reliance to depend on his own ability to do a job unaided; every chance should be given him to learn all that is requisite to make him a thorough mechanic, as it is as much injury to the reputation of a shop to turn out an inferior workman (a chunker) as it is to turn out an inferior and defective engine or tool.

The employer or foreman should not be always watching the apprentice in hopes of detecting him wasting either time or material; for if a boy has an idea in his head which he desires to perfect—whether it be in the shape of a pair of legs made into calipers, a "try square," in the "truth" of which *he* has implicit reliance, a center-punch, hammer or tool, or may be a valuable shop hint, that had escaped your sight—you can rely upon it, he will find (not steal) both time and material to do the job to his liking. He is boss of that job and you may depend upon it.

That reminds me of an incident that occurred during the last year of my apprenticeship. The practice at that time was to employ many apprentices and very few journeymen. One of the partners of the firm generally acted as foreman—the reverse of this is the practice at present day. A task of so many pieces was set before each boy or man, as a day's work; all work over that number was paid for by the piece. The tools in use at the time were of the most inferior kind, and each hand had to keep his own lath and bench tools in order in his own time. Any tool which could be devised to aid in performing the task in less time was eagerly sought for. One part of the work occupied two hours time every day, which, with the proper tool, specially designed for the purpose, could be done better and more uniform in five minutes.

I conceived the idea of inventing a tool to do this job, but fearing to receive the usual brutal rebuff from the boss, I set to work to perform the task in my own time. I devoted my spare hours at night to the drawing, and half the dinner hour every day to the pattern, until it was finished. I had castings made, and the parts finished and ready to put together and try on the first opportunity I could get.

The boss came "nosing around" the boys' bench drawers, and in mine he found the prospective device, which would have given him a monopoly of one branch of his business had not his own meanness prevented it. His discovery embraced a frame and a few small shafts and screws, two little grooved wheels and a bifurcated lever and handle. I am charitable enough to believe that he supposed that it was some kind of a toy I was making at the expense of his time and material, but without waiting for an explanation he began to curse and fret, and finally broke up my device with a hammer and threw the parts into the scrap heap.

I had no redress left me, as to attempt a remonstrance with him would lead to fisticuffs, therefore I had to grin and bear it. I need hardly say that when my apprenticeship time expired I left the shop, and that a rival shop received the benefit of that and many other inventions of mine, which enabled them to manufacture and sell their goods more cheaply than before. Several patents were issued years afterwards to other parties for the application of the principles embodied in my device, for other purposes.

This is one of many instances which I could relate where the first efforts of the apprentice to bring out and apply his individual talent was checked by ignorant and unkindly rebuffs. Therefore, I say *give the boy a chance.*

An Improvised Trammel—Why Belts Drive.

Editor American Machinist:

Enclosed shows in actual size a handy rig for a hastily-needed trammel, devised by Harry W. Champion, a learner in my drafting room. *B B* is a thin wooden strip, *C C* are two blocks of cork, pierced for the strip. The needle point *N*, and pen *P*, belong to the 6″ compasses, and are laid in grooves cut in the sides of the cork blocks, being held from coming out or sliding up and down by the drawing tacks *T T*.

The strip and corks are not new, but the manner of utilizing and holding the pen and center point seem to me to be both new and good.

In your issue of April 1, Mr. A. Christoffel alluding to my published remarks on the subject of belt transmission, states, as his opinion, that "the actual driving power of a belt on any kind of a smooth pulley is measured by the atmospheric pressure on the surface of the belt in contact with the smallest pulley; that is, always provided that the belt is clean." In the first place, few belts are clean, and pulleys vary greatly in smoothness; and as dirty belts do drive, and rough pulleys also, the theory cuts out 95 belts in 100.

By oiling belt and pulley the contact is better than where they have their natural surfaces. If there were a vacuum formed at all it would have a better show than with the usual run of belts and pulleys, yet the driving power is less.

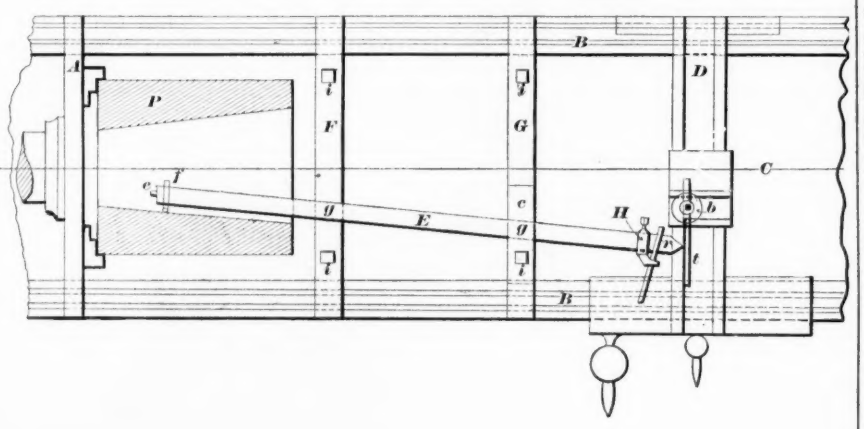
Against the "vacuum" theory there is another one equally wide-spread and just the opposite—that there is a film of air between belt and pulley. I have seen holes drilled in the pulley face to let the air out, and in another to let it in. I think that neither the vacuum nor the air plan is correct, and that if either of them existed, its influence would be so slight as to be almost immeasurable.

In reference to tighteners, as ordinarily applied, they act in two ways: to increase the arc of contact, and to augment the tension.

For softening leather belts I use hot soap and water, and then give them a good dose of hot castor oil, which makes them durable and supple, and increases their adhesion.

I want to reiterate in the matter of belt transmission, that the driving power is measured by the product of the lineal speed by the difference in tension between the slack and the tight folds, and that this latter is due to the combined influence of the friction and the elasticity of the belt.

Philadelphia, Pa. R. GRIMSHAW.

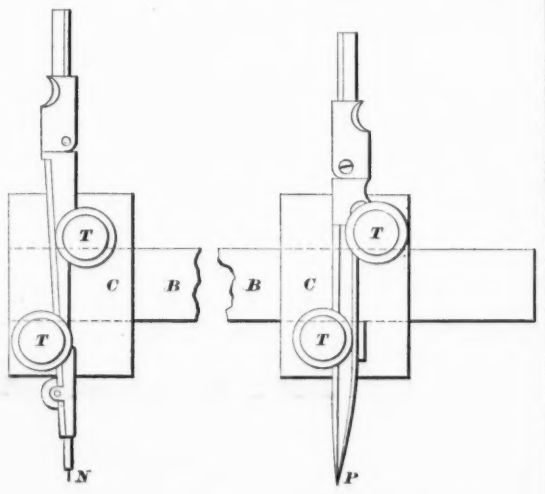


LETTERS FROM PRACTICAL MEN.

A Rig for Boring Tapers.

Editor American Machinist:

The accompanying engraving represents a rig for boring tapers on a lathe which has no attachment for that purpose: *B B* represent the ways of the lathe; *A*, the face plate or chuck; *D*, the carriage; *P*, the piece to be bored; *C*, center line; *F G*, two pieces of hard wood, bolted to the ways by the bolts *i*; *E*, the bar that carries the tool *f*, which is held in place by the set screw *e*, that may be placed in the end, top or bottom of the bar; *H* is a dog held by a rod of iron to keep the bar from turning.



The bar *E* is let into the blocks at *g*, which can be calculated very nearly at first; then accurately adjusted by shifting the blocks. Block *G* needs a cap *c*, to hold the bar down. Then bolt a tool *t*, or some other straight piece of steel, in the tool post *b*, and put a few drops of oil on the rounded point *r* of the bar; then go ahead.

The parts which compose the rig can be picked up in almost any shop, or made at short notice.

To make this rig nice, it could be made with swivel boxes, adjustable on the supports *F G*, for the bar to slide in, and a little roll put in the end *r* of the bar.

This is a very good rig, especially where the piece to be bored has a solid bottom It is of my own design, and every body is welcome.

Another good way is to lift the head stock and put two thin parallel strips under it, and slue it around until the desired taper is obtained. This procedure works well where the hole to be bored is to have a slight taper.

Mr. Foote's bar can be made cheaper by taking out the feed screw and putting in a spline, with a feather in the collar to fit it; then attach the collar to the tool post by a rod, and use the regular feed of the lathe.

Hyde Park, Mass. F. N. ISHAM.

High-Speed Engine Difficulties.

Editor American Machinist:

Mr. Hague's articles on the comparison of high and low-speed steam engines are quite interesting, and some of his points in favor of a lower speed than that which engine-builders seem to be drifting to are well taken.

Now, although the writer has been educated to, and had some theory and considerable practice on, high-speed engines, he does not feel disposed to advocate high speed, except where the conditions seem to demand its being employed; and, if economy in oil, waste and all the minor items that are necessary in the engine room, and repairs, stoppages, etc., are taken account of with the same accuracy that the coal bills are, and all added together to show the total cost of the power, the writer believes that moderate speed will show the best results nine times out of ten.

Stoppages are always costly when occasioned by break downs, and especially so in a busy season, and the writer's experience has been that high-speed engines invariably give the most trouble in this way, while engines speeded moderately would run from morning till night, week in and week out, like clock work.

Let us describe the scenes in an engine room containing a pair of very large and massive high-speed engines. Time, 6.45 A. M. The firemen have been busy for an hour getting up steam for the day's run, and the engineer and his assistant have just donned their uniforms, consisting of suits of oily—*very oily*—overalls (in use five days).

The chief takes up a small oil can, and, after manipulating a few valves, oils the air pumps and pumping engine, and soon has that part of the machinery running and the vacuum in good form. His assistant has commenced his duties also. The first impression one gets, on seeing his movements, is that he has a starting and a stopping place at one point. That point is the oil tank. He has started out with a half gallon of oil, made the circuit of the room, and comes back for a fresh supply, to be used later. By this time the bell rings, and the engines are soon under way; so is the oiler. Round he goes, twice without stopping, and then brings up at the oil tank again. The chief walks around also. Then there is a pause of ten minutes, during which the chief and his assistant both wear an expectant look, as if something might happen which they did not want to see. Then the oiler grabs his oil can and starts on another lap. In ten minutes he has brought up at the oil tank again. He rests five minutes this time, and then makes another lap; rests ten minutes, makes another lap, and brings up at the oil tank again. After filling his can, he measures the oil in the tank, giving a sidelong glance at the chief. The chief catches the look, and evidently knows the meaning of it, for he says something about high speed in connection with another word, which *may* mean a reservoir of water, or something else.

Things move along in this manner for some time, when all at once the chief jumps up, elevates his nose, gives two or three sniffs, makes a rush at his assistant, and shouts "Something hot," and away both go on the run; one in one direction and the other in the other. They both meet at the unfortunate journal, and then fly for the hose and succeed in half drowning each other before the two streams are directed to the right place. A few moments of suspense follow, but the water gets the mastery, and the danger of a stop is passed This event has an influence on the oiler, and he makes more laps to the hour. All goes well now until afternoon, when the scene is repeated with the addition of a slow down for twenty minutes.

To slow down costs money, and the chief after making a few forcible remarks says he will "fix" those journals so they will stop heating. There is a determined look on his face, or, in other words, his Dutch is up. We have a desire to ask questions but there is a let-me-alone-I-have-no-time-to-talk expres-

sion on his face. Let us call a few weeks later, probably he will have more leisure time then.

It is several months ago since we left our friend, the engineer of the big high-speed engines, in tribulation over a hot bearing. Let us step over and see him again. On our entrance to the engine room the first thing that attracts our attention is the look of peace and quiet worn by everything. The engines are moving along at the same rapid speed, while the chief is sitting in a comfortable chair with his feet elevated, and a copy of the AMERICAN MACHINIST in his hand. We look around for his assistant, and see him wandering about leisurely, and we miss the two-quart oil-can in his hand. Neither are his clothes so oily as formerly. The chief wears a boiled shirt, and we miss that peculiar look on his face. The engine room looks neat, and there are no puddles of water and oil around the bearings as formerly. We approach the chief, stir him up, and he greets us with a smile, in decided contrast to the dont-want-to-be-bothered look he wore on our previous visit.

We look inquiringly and remark: "You look cheerful."

"Well, I feel kind of happy now. I have found out after much tribulation that heavy high-speed engines need plenty of oil, in fact everything must be kept flooded."

We suggest big oil bills.

"No, the days of big oil bills have gone by, but we put oil on each journal at the rate of a pint a minute, catch it and run it on again. Instead of filling oil cups every half hour or less, we fill up the oil reservoir every two or four months, and hot bearings are unknown. Our oil bill is reduced some 85 per cent., and everything moves along serene."

Then we were shown an ingenious arrangement of pumps and pipes for circulating the oil on the journals and crank pins.

We then start up a conversation about steam engines, and high speed ones in particular, and eventually the subject of indicator diagrams comes up. The chief says he has a few to show in reply to our desire, and hands us one. "That is a good steam line for high speed," we say; but we think we see a suspicion of a wink, and look inquiringly.

"Yes, the steam line is good, but the piston of the indicator, brought up against the top of the indicator cylinder, which accounts for it. "Here, look at this one that represents a heavy load."

We see that it has figured up to 568 H. P., and we see too that the steam line has dropped down some ten pounds from the admission to the point of cut-off—about one-third stroke—and that the vacuum in the cylinder is some eight or nine pounds short of that in the condenser.

"That is one of the advantages of high speed," he says.

We intimate that a less load would show better results, and then a variety of diagrams are put into our hands, and we see that a lighter load improves the exhaust line decidedly, but the steam line is still very bad.

"Well, now," we say, "your average load shows up pretty well, and it is seldom that you carry an extra heavy load."

"Granted," he says, "but when we do get a heavy load to drive, and are just able to keep up to speed with the safety valves blowing off, we do not feel very amiable when this choking down process is going on at each end, reducing the economy when we can least afford it. Theorists say that steam must be used quickly for economy. Is the economy not overbalanced when the steam is wire drawn in its efforts to get into the cylinder, and cramped when it tries to get out?"

"Do you believe in superheating steam for economy?" we ask.

"With moderate speed, and uniform load, and careful management, it may produce good results, but superheated steam, high speed, and big engines do not go together, and especially so when your engines spin along from five to eight minutes after steam is shut off."

"Why?" we ask.

"You are aware no doubt that nine-tenths of the lubrication a cylinder gets is from the moisture in the steam. Now imagine the condition of a hot cylinder with no steam in it, and a condenser at the other end taking away everything in the shape of vapor; scant oil lubrication, and two cast iron surfaces moving over each other at the rate of 700 feet a minute."

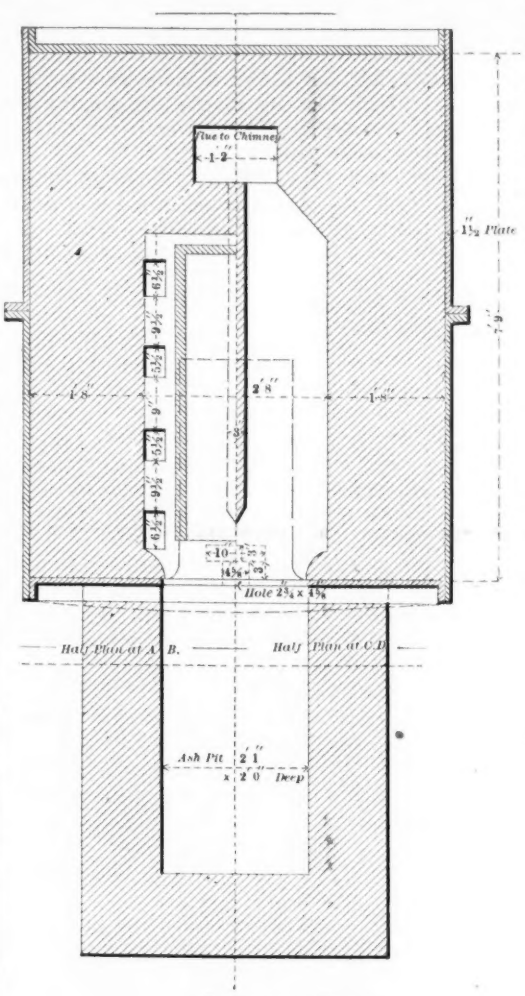
We suggest a little oil when the throttle is shut.

"Yes, a little, also a little more; in fact from a pint to a quart every time we shut down."

High speed is very fine to theorize over, plan, and build, but the poor engineer who cannot plan and construct efficient and labor-saving methods of lubricating his engine, and do the necessary adjusting and repairs in a very skillful manner does not think so, when he goes home every night played out with the incessant watching that high speed engines demand.

S.

Brooklyn, N. Y.



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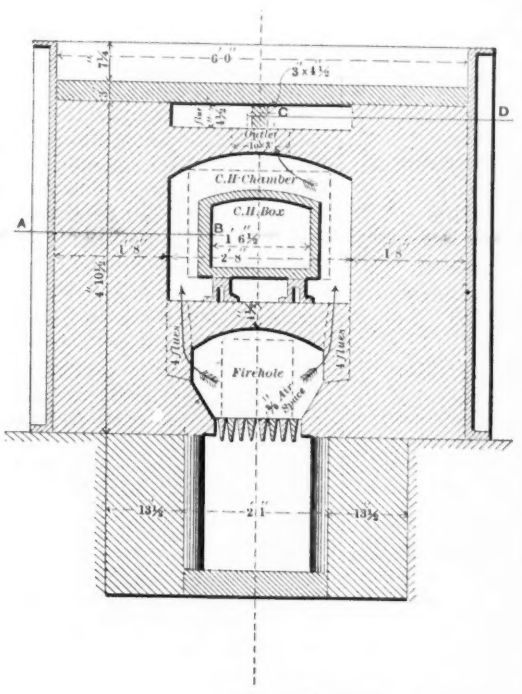

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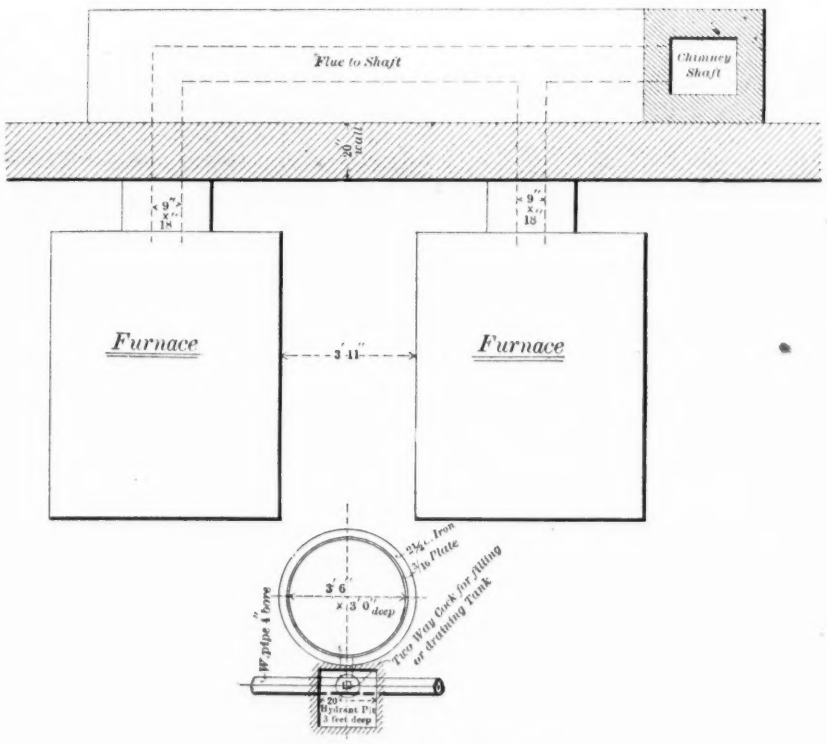
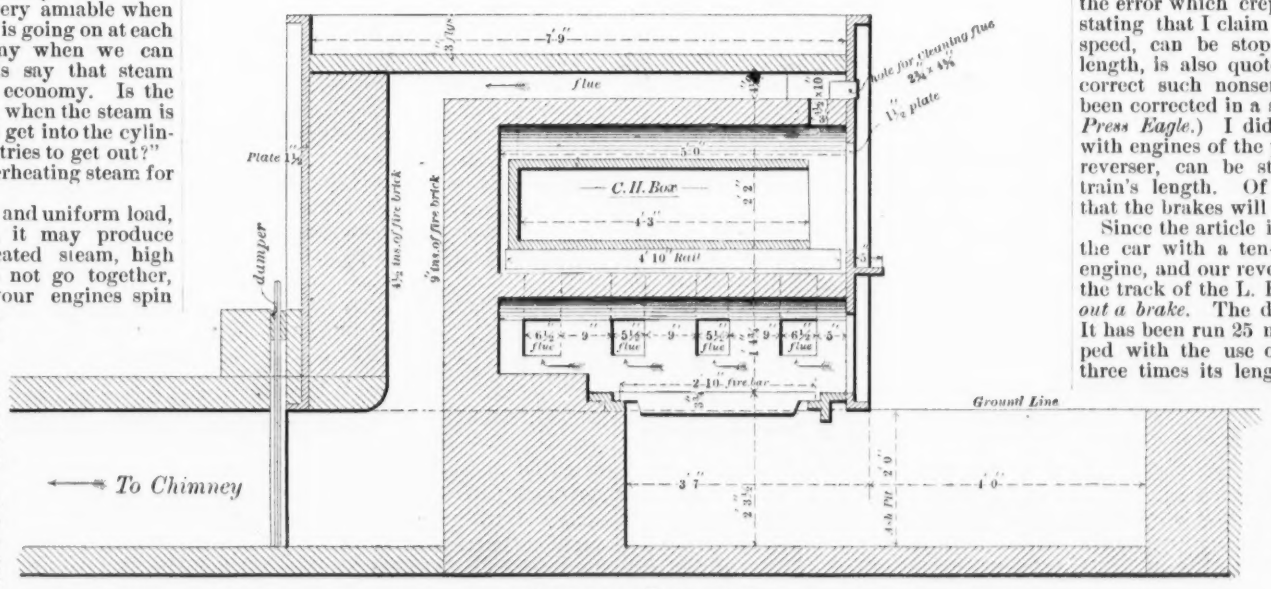


ARRANGEMENT OF FURNACES.



SECTIONAL ELEVATION.

Case-Hardening Furnace.

Editor American Machinist:

I send you a sketch of a case-hardening furnace, somewhat different to that shown in your issue of Feby. 25th. It has been in use for some years doing very good work, chiefly for locomotives. A brief description may be of interest to your readers.

The outside is formed of four cast-iron plates, within which the furnace is built. The chamber in which the movable cast-iron retort is placed, is immediately over the furnace. On each side of the furnace are four flues carrying the products of combustion into the retort chamber, whence they flow over the top of the retort to the hole 10" x 3" near the front plate, when they return above the crown of the retort chamber and thus on to the chimney flue. The arrows distinctly show the course taken. The flue above the crown of the retort chamber is divided by a diaphragm formed of a single brick, for the purpose of distributing the heat.

A section of the cast-iron base is shown. It is flush at the bottom and can easily be slid in and out on the two old rails shown beneath it. These rails serve to allow the heat to get at the bottom.

The retorts swell at the sides with constant heating. The door-way is therefore made wide enough to allow for this.

The end of the retort is bricked and then luted with clay. A round half inch test rod is built in the brick work and can be withdrawn from time to time, and broken to see the depth of hardness attained. A cast-iron door (not shown) closes the opening to the chamber.

Bituminous coal is used and a very even temperature attained.

No bones or charcoal are used. The mixture used is one pound of saltpeter to eight pounds of leather. The saltpeter must be pounded up fine and sprinkled through the leather so as not to lie on the articles to be case-hardened. The work should be surrounded on all sides by the mixture, so as not to touch the sides of the retort. The coke resulting from the leather, etc. can be used over and over again, if some fresh material is used each time and the work is hardened quicker than if new stuff is used.

From three to four hours is the usual time occupied in hardening. Where great depth is required more time must be given. Two of these furnaces are working, and are arranged with a dipping pit between them of such a size as to take all ordinary work.

CRANK.

Locomotive Department, Great Southern and Western Railroad, Dublin, Ireland.

Correcting an Arkansas Journal.

Editor American Machinist:

I notice in your issue of April 8, under the head of "A Remarkable Locomotive," the error which crept into the *Press Eagle*, stating that I claim that a train under full speed, can be stopped at less than a car's length, is also quoted by you. I desire to correct such nonsense, (which has already been corrected in a subsequent issue of the *Press Eagle*.) I did say, that a locomotive with engines of the pattern of ours, with our reverser, can be stopped in an ordinary train's length. Of course, it is inferred that the brakes will at the time be applied.

Since the article in question was printed, the car with a ten-horse power oscillating engine, and our reverser, has been placed on the track of the L. R. M. R. & T. Ry., *without a brake*. The drivers are 33" diameter. It has been run 25 miles an hour, and stopped with the use of the reverser alone, in three times its length—16 feet. Were you to see the little locomotive move, stop, start, and back, on the steep grade of Fourch Mountain, you would express the astonishment that others have.

Please make the above correction.

J. W. BOCAGE.

Pine Bluff, Ark.

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NEW YORK, APRIL 22, 1882.

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Spring Prospects.

Those who have looked for a falling off in the iron and machinery business with the advent of spring and open navigation have not realized their expectations. Pig iron, it is true, has declined somewhat in price, thereby causing slightly lower prices for some kinds of heavy iron work, although merchant iron has held its own with firmness. Orders for all kinds of shop machinery are still abundant and machine tools for early delivery, are yet difficult to obtain, especially the larger sizes. Sensational reports have been published by some of the daily papers to the effect that locomotive building had received a serious check, many of the orders placed with the Paterson shops, having been countermanded. We have endeavored to trace these reports to some reliable source, but careful inquiry at all the three of the Paterson locomotive shops has shown that these rumors are entirely without foundation. No orders, so far as we can learn, have been countermanded, but on the contrary, a large number of new ones are to be placed. The credit of some new railroad companies is not of the best, and it is said that in one or two instances, engines completed for delivery have been held in the shops awaiting payment, or security for payment, before sending out. Freight cars are not in as active demand as they were and are somewhat lower in price. The recent record of new railroad building is something to wonder at. The *Railroad Gazette* of March 31st, notes the construction of 1,800 miles of new railroad thus far this year, against 541 miles reported at the corresponding time in 1881, 795 miles in 1880, 298 miles in 1879, 226 miles in 1878 and 165 miles in 1877. The question may well be asked whether railroad construction is not being overdone, but if all the new roads are to be kept running, a demand for machinery and supplies far greater than that which is now experienced, may be expected.

An Astonishing Mechanical Discovery.

It has in the past been somewhat common for those who presumably spoke from experience, to offer advice to boys who are desirous of arriving at what has been properly considered a position as worthy of honor as any in the land;—that of a first-class mechanic. That advice has usually contemplated entering a shop as apprentice, and by careful attention to shop duties, and by systematic reading and study, working their way gradually and surely upwards in the scale. Those who have offered this advice have generally tried to make plain what they thought experience had taught them, viz: that while a most excellent foundation could be laid in the three years during which, in the majority of instances, a young man is supposed to work at a trade as an apprentice, it really took a much longer time to acquaint himself with what he ought to know of a trade. During this time, however, it has been urged that his services would, from year to year, become more and more valuable to some one. This, in brief, has been the advice of old mechanics of recognized ability, and we admit that the AMERICAN MACHINIST has occasionally proffered substantially the same advice.

Our attention is at present called to a most remarkable article of five columns in length which appears under editorial sanction in a paper published in Chicago, entitled *The American Artisan, Tinner and House Furnisher*, which, if we may credit the statements, or assertions, demonstrates that all this advice which has appeared to most people to be right, is entirely wrong and misleading, and ought to be suppressed forthwith. The article referred to purports to be an account of the working of a plan adopted in a Western stove foundry, which, as a new invention, overturning all previously conceived ideas of the value of skill that comes from years of practical experience—at least in the mechanical operation of moulding—is worthy of notice.

This foundry, through some trouble with the journeyman moulders, was moved last year to dispense with their services, and to run their shop with boys, and as a result we are told that although the system has been in operation only about eight months, these apprentices are doing more work than experienced journeymen.

"It has been found," the *Artisan* affirms, "that the process of moulding is comparatively easy to teach an intelligent lad."

Some old moulders, who, after working at the trade perhaps twenty-five years, and who are then willing to admit they have a great deal to learn, may be inclined to take exceptions to this, particularly when they see in the context what the comparison must have been made with; but we ought to be prepared for discoveries in times like these.

Again we are told that "the average age of apprentices now at work in the foundry is between eighteen and nineteen years, although, in some instances, youths of sixteen are speedily attaining a remarkable degree of perfection of work, and in a few cases younger lads have been admitted by special request, and are pursuing their course with satisfaction to the proprietors."

Further along we read that "apprentices of seven, and even six months' standing, are credited on the books with larger quantities of work turned out than average journeymen working upon the same class of patterns, and" (we confess to the italics) "*if paid according to the same rates* would frequently excel the 'jours' in the amount of wages received."

We might quote further, all in the vein that the utility of these boys, after a few months, was superior to that of journeymen of years' standing; but what has gone before is sufficient to show that, from the *Artisans'* point of view, a complete revolution has been brought about, the result of which is that skill and experience in the mechanic arts, so far from being desirable, is quite the reverse. Hereafter let proficiency go begging. It will only be necessary for the mechanic to demonstrate how much practice he *hasn't* had to entitle him to consideration.

We may shortly expect to see that Western proprietor's prediction that "a few years more will see the other foundries of the country forced to adopt this system" fulfilled in all branches of mechanics, except, perhaps, in prison manufactures, where, in one case, the State of New York has gone a step further in the way of "system," by hiring one thousand moulders to a stove maker for five years, at 56 cents a day for each man.

Pleasant as this will be, there is one phase of it that hardly seems to have occurred to our contemporary, and that is, What are the boys to do after they shall have become journeymen? Nothing is more logical, reasoning from the premises laid down, than that they will be of but little use as compared with boys from sixteen to nineteen; and hence, as a matter of course, succeeding boys will compel them to step out of the way. Perhaps, however—and we claim credit for the suggestion—they could apprentice themselves to another trade, working at that until they ceased to be of any particular account—logically, we infer, until they became journeymen—and so on through the round of the trades.

While we have no interest in the relations between this Western foundryman and his workmen, journeymen or apprentices, the theory of our contemporary is nothing less than a stroke of genius, and wil undoubtedly make the skilled mechanics, as well as manufacturers who don't happen to have an assortment of boys on hand, tremble; while it may teach us all how easy a matter it is for science to overturn old-fogy ideas. No amount of practice can prevail against such reasoning; and if now a way can be devised whereby the prospective mechanic can begin at the end and work backwards, the plan will be complete.

If in all these five columns of matter we were able to learn something definite as to the quality of the work—for instance, as compared with that of other foundries—it would be interesting. As it is, perhaps the part left out may be the most entertaining of all.

We are having repeated inquiries asking us to name the numbers of the AMERICAN MACHINIST containing the articles by Frank H. Richards, "Screw Cutting on the Engine Lathe." We take this opportunity of answering several such inquiries by stating that these articles appeared in our issues of Aug. 13 and 20, and October 15, 1881, and that these numbers may be ordered through any news dealer equally as well as from this office.

Mechanical Engineers' Spring Meeting.

The spring meeting of the American Society of Mechanical Engineers commences in Philadelphia next Wednesday, April 19th. From the programme just issued by the Secretary, T. W. Rae, 239 Broadway, New York, we make the following extracts:

The Headquarters and Reception Rooms will be at the Engineers' Club of Philadelphia, No. 1518 Chestnut Street, which has courteously thrown open its doors to the Society.

FIRST DAY, WEDNESDAY, APRIL, 19.

Opening Session—10 A.M. Lecture Room of the Franklin Institute, 7th Street, above Chestnut. General business, professional papers and discussion.

Holley Memorial Session—2.30 P.M. Lecture Room of the Franklin Institute, 7th Street, above Chestnut. A committee appointed for the purpose, will submit resolutions to the Society; Mr. James C. Bayles will pronounce a eulogium upon the deceased, and remarks from various members may be expected.

Evening Session. Lecture Room of the Franklin Institute 7th Street, above Chestnut. The members are requested to muster at Headquarters at 8 o'clock, in order to proceed in a body to the Academy of Fine Arts, Broad Street above Arch, in which the citizens of Philadelphia will hold a reception in honor of the Society.

SECOND DAY, THURSDAY, APRIL 20.

This day will be devoted to an excursion on the Delaware River, with a collation aboard the steamer. The places of professional interest which the Society is invited to visit are: The 25th Ward Gas Works, The League Island Navy Yard, Grain Elevators. Wm. Cramp & Son's Ship Yard, John Roach & Son's Ship Yard and Machine Shops.

At the same time escorts will be ready to conduct such as prefer, to the U. S. Mint, Municipal Buildings, Locomotive Works, Water Works, Elevated Railways, Parks and Bridges.

Detailed programmes giving specific information with regard to excursions will be issued at the opening session.

The evening will be devoted to the Subscription Dinner.

THIRD DAY, FRIDAY, APRIL 21ST.

Morning Session—10 o'clock. Lecture Room of the Franklin Institute, 7th St., above Chestnut; professional papers and discussions.

Afternoon Session—2.30 o'clock. Lecture Room of the Franklin Institute, 7th street, above Chestnut.

Prof. Thomas Egleston, Chairman of the Committee on "Tests of Iron, Steel, and other Materials," will address the Society relative to a joint effort on the part of engineering and technical organizations to secure the re-establishment of a U. S. Commission on this subject. Other speakers will also take part in the debate.

Evening Session—8 o'clock. Lecture Room of the Franklin Institute, 7th street, above Chestnut. Professional papers, discussions and adjournment—unless it shall prove necessary to order a session for the following day.

Some of the Papers announced for the meeting are as follows:

"Results of a Test of Upright Boilers and Pumping Engine."—J. S. Coon.

"The Chronograph for Engineering purposes, with the Hipp Escapement."—W. R. Eckart.

"On the Several Efficiences of the Steam Engine."—Robert H. Thurston.

"The Thermodynamics of certain Worthington and other Compound Pumping Engines."—S. W. Robinson.

"Determination of Heating Surface of Ventilating Flues."—Wm. P. Trowbridge.

"Note on the Economy of the Windmill as a Prime Mover."—Alfred R. Wolff.

"Screw Propulsion."—John B. Root.

"A Standard Gauge System."—George W. Bond.

"Description of the Edison Steam Dynamos in the New York Central Station."—Thomas A. Edison, Ph. D. and Charles T. Porter.

A mining and industrial exposition will be held at Denver, Col., in August.

The division of electricity is the largest in the Patent Office.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(129) A. D. M., Cleveland, Ohio, asks: Will you please tell me what form of eccentric gearing is illustrated on the printing press in your issue of March 25? *A.* Ordinary eccentric spur gearing.

(130) T. R. M., Rochester, N. Y., asks: At what part of a worm wheel that is hollowed out to fit the screw shall I measure the pitch diameter? *A.* Measure the mean of the greatest and least pitch diameters.

(131) J. B. F., Lawrence, Mass., asks: Will you tell me how to harden taper fluted reamers without springing? *A.* We think this has never been accomplished except by accident. The practice is to work with care, and grind true after tempering.

(132) A. S. B., Sharpsburgh, Pa., writes: I have a device for hanging pictures on the walls of a room without the use of nails or screws, or without in any way defacing the walls. It can be made ornamental as well as useful. Do you think it would pay to get the device patented? *A.* We could form no opinion except we knew what the device was.

(133) G. H. P., Portsmouth, Mich., asks: What is a right and what is a left hand engine? *A.* We believe the usual practice is to call a right hand engine one in which the fly-wheel is at the right hand of the frame when looking at it standing at the cylinder. In locomotive practice the right hand engine is to the right of the engineer as he looks ahead.

(134) W. S. Sherbrooke, Canada, asks: 1. Will you please tell me how to set a governor valve on an engine so as to run the engine say 150 revolutions per minute? *A.* Arrange the pulleys to drive the governor at the speed marked on it when the engine makes the required number of rvolutions, then raise or lower the valve as may be required to bring the engine to the right speed. 2. What numbers of the AMERICAN MACHINIST contain rules for cone pulleys? *A.* Feb. 5, Sept. 17, Oct. 15, and Nov. 26, 1881. Jan. 7, Feb. 25 and April 1, 1882.

(135) W. H. W., Easton, Md., asks: 1. Is it dangerous to put coal oil in a boiler after cleaning out and what will be the effect when firing up? *A.* There is no danger in the use of crude oil in the way you describe, unless, possibly, if too much is used. The effect in many instances is to loosen the scale on the shell and tubes. 2. What is the best piston and rings for an engine? *A.* There are many good steam engine pistons made, one of which may be the best in one instance and another in another instance. We believe no one is competent to say which is the best.

(136) F. D. H., New York, writes: Having been a constant reader of your valuable paper for some time, and being desirous of obtaining information in regard to the following, I can do no better therefore, than refer to you: What weight ball and and how far from the fulcrum must it be for the boiler to escape steam at 25 lbs. steam to the square inch, with 2″ area of valve, and how much must the ball be moved for the boiler to escape steam at 30 lbs.? By answering the above you will confer a favor. *A.* You have neglected to state the distance of valve from fulcrum, without knowing which no calculations can be made. See answer to E. W. B.

(137) A. L. S., Savannah, Ga., writes: I have a wooden tank in which I catch water from the roof of building covered with tin. The tank is covered. When the water is warmed it assumes a redish color, and rusts clothing that is washed in it. Can it be possible that the particles of iron worn from the mules shoes and wagon tires find their way on the roof and into the cistern, and if so how can it be counteracted? *A.* We hardly think this is the trouble. It would be well to have a sample of the water analyzed with a view to remedying the evil. You might try purifying the water by using a table-spoon-full of alum, well stirred up in a hogshead of water and allow the water to settle three or four hours.

(138) G. N. F., Eaton, N. Y., writes: Please inform me why, in turning pulleys tapering on the mandrel, the edges will not be of the same diameter? I take pains to set the poppet head on each side equal, to place the pulleys equal distances from the end of the mandrel, and to set tool same height, but without avail. It is not the wear of the tool that makes the difference. Can you tell me what is the trouble? *A.* In theory your plan is probably all right, but it would seem that it is not practicable. There is no other reason for the occurrences you mention except that you do not work as closely as you think. Try turning the taper from the center, changing ends with the mandrel or changing the set over of tail stock.

(139) E. W. B., Paris, Texas, writes: I am running an engine 10″x20″ at 110 revolutions, 60 pounds boiler pressure. 1. About what power is this engine? *A.* From 20 to 25 horse power. 2. The safety valve is 2½″ diameter, valve and stem weigh 1 pound 1 ounce; lever 18″ long, weighing 6 pounds 9 ounces. The ball weighs 60 pounds. The fulcrum is 2½″. The weight is 18″ from large end of lever. The steam gauge shows 60 pounds pressure when the valve begins to blow off, and will go to 70 pounds if the steam rises. Is the gauge right? *A.* You have not stated all the points necessary to be known for determining at what pressure the safety valve will blow off. As we understand your statement it would be about 90 pounds. You can determine this by the plan described in AMERICAN MACHINIST of May 8, 1880. We should advise that you have your gauge tested. It is unsafe to depend on an ordinarily constructed safety valve for determining what pressure you are carrying.

(140) J. W. N., Belfast, Ireland, asks: 1. Can you recommend any of the sulphur compounds for leveling up the bed of a steam engine? *A.* We have used common stick brimstone for years without a single instance of failure. 2. What is the best way to use it? *A.* Our practice has been to level up the engine by using small iron wedges bringing the hold-down bolts to a fair bearing. Then cut some wooden strips to lay up close to the frame all around, and putty up any slack places there may be around the strips. About once in 18″ leave a hole for pouring the brimstone, building up a head or riser of putty or fire clay. Melt the brimstone in an iron kettle over a *very slow* fire, and when it is quite limpid, pour it. It will run very freely, and when hard the hold-down bolts can be set down firmly. In melting the brimstone great care must be had that it does not take fire. Have ready some bagging, or equivalent, and if it accidentally takes fire, remove the kettle from the fire and smother it by covering it over. As before stated, the fire must be a slow one. If the brimstone gets too hot it becomes thick, the remedy for which is to set it off the fire to cool. All holes must be carefully stopped up, as the brimstone will run through a very small aperture. Brimstone is but slightly affected by temperature, and if there is reasonable bearing surface it is almost equal to a solid stone bearing. In hundreds of cases we never knew it to fail when properly used. It can be used on stone, brick or wood.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

We receive numerous inquiries relating specially to matters of private interest. While desirous to oblige our friends, we would suggest, that an advertisement of two or three lines under this heading will usually develop the desired information easily and quickly.

Portable Forges, $10. Holt M'fg Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

James W. See, Consulting Engineer, Hamilton, O.

Presses and Dies. Ayar Mach. Works, Salem, N. J.

Alfred Wilkinson, Expert Tests of Steam Engines and Boilers, 123 N. 4th St., Philadelphia, Pa.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

R. Dudgeon, 24 Columbia st., N.Y., Improved Hydraulic Jacks and Roller Tube Expanders.

100 New Lathes, Planers Drills, Millers, &c., (light & heavy). Send for list. Kelly & Ludwig, 49 & 51 North Seventh street, Philadelphia, Pa.

Machinists' Bench Tools; largest stock in the United States. Send for Machinist Catalogue, 212 pages. Tallman & McFadden, 607 Market st., Philadelphia.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John Street, N. Y. Mention this paper.

"Slide Valve Gears," by Hugo Bilgram, published by E. Claxton & Co., Phila., describes the easiest method known for correctly proportioning slide valves, link-motions and cut-off gears; price, $1.00.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

More than 50,000,000 square feet of Prepared Roofing used in the past ten years. It is now being put upon the best stores on Broadway, and upon the best and most costly dwelling houses built upon Fifth Avenue, New York City, with entire satisfaction. T. New, 32 John street, N. Y.

For Sale. Berryman Heater, 32″ x 9 feet. Used but a short time. Has been thoroughly overhauled. New shell put on and is practically as good as new. Will be sold very low. Call on or address Geo. S. Strong, 7th and Chestnut, or call at I. P. Morris Co.'s Port Richmond Iron Works, Philadelphia.

The Universal Calculator—A novel labor-saving machine for solving questions in arithmetic and mensuration without mental labor. The most tedious problems solved in less than half a minute. Invaluable to engineers, mechanics, and business men. Sent free for $1. Send for circular. Address W. H. Wythe, Red Bank, N. J.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

Ealy's "Blue Book,"—Special classified list of Machinists, Machinery, Railway, Engine and Boiler Makers supplies, etc., with financial standing and paying qualities of all dealers and manufacturers. Much more convenient and reliable than any other work of the kind published. We also furnish full detailed written reports. Price $30 to July 1, 1882. The JOHN W. EALY COMPANY, 51 Chambers street, New York or 79 Dearborn street, Chicago, Ill.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 Humorous illustrations; 320 pages, 12 mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

MANUFACTURES.

The Moline (Ill.) Boiler Works are about to enlarge.

Three new iron foundries are talked of at Taunton, Mass.

A stock company is building a car factory at Marietta, Ga.

The City Foundry, Holyoke, Mass., will soon build an addition, 100 x 30 feet.

The shops of the Bee Line Railroad at Delaware, O., are to be enlarged.

The Pittsburgh Locomotive Works, Allegheny, Pa., are building an addition to cost $50,000.

The Northwestern Car and Manufacturing Company, with $5,000,000 capital, has been organized at St. Paul, Minn.

The new sewing machine enterprise at Brattleboro, Vt., is expected to begin business next month.

The Wrought Iron Bridge Company, Canton, O., completed last year 267 bridges out of orders for 314 received in that time.

A new joint stock company is to be formed at New Britain, Conn., which will erect a large iron foundry on their land.

C. W. Le Count, South Norwalk, Conn., filled a large order for lathe dogs, from Calcutta, India, last month.

The Link Belt Machinery Company, Chicago, is building a new foundry and will shortly begin the erection of a new machine shop.

The European & North American railway company will erect new and permanent machine shops at Mattawamkeag, Me., during the coming season.

A movement is on foot to establish locomotive works at Hamilton, Ont., with a capacity of 60 engines per annum. Capital required $300,000—*Railway Age.*

The Penn Hardware Company, Reading, Pa., have begun an addition to their works calculated to employ 40 more workmen, 30 of whom will be moulders.

The Niagara Stamping and Tool Company, of Buffalo, N. Y., manufacturers of presses, tools and dies for tin working, are adding a new 3-story addition, 40 x 40 feet.

The town of St. Albans, Vt., has voted to exempt the shops of the National Car Company, from taxation for ten years, provided they are erected at that place.

A company with a large capital is being formed in Peterboro, Ont., for the purpose of starting a car factory. The town council has agreed to purchase $20,000 of stock.

D. J. C. Arnold, New London, O., makes a specialty of manufacturing brickyard supplies, for which he has demand from all parts of the country. His new brick mould is quite successful.

Wages of the 700 iron moulders of Naugatuck, Conn., were advanced 10 per cent. April 1st. It is probable that other manufacturers in that town will increase their employes' pay.

The Boston Rubber Co., which was announced as having settled upon Holyoke, Mass., for a location, will go elsewhere. The water-power company will not give them the 20 acres of land wanted.

James Mahony, manufacturer of Mahony's Grate Bar and Universal Furnace, has removed from 109 Liberty Street to Room 73 Astor House, New York. His business is increasing at a rapid rate.

A new company composed of prominent manufacturers has been formed in Philadelphia to build steam engines. They have leased the shops of the Kensington Iron Works for that purpose, and are having tools built to fit them up.

Contracts have been let by M. L. Filley, jr., for the erection of a foundry for the manufacture of stoves at Newport, Conn. It is expected the works will be completed this fall, when Mr. Filley will remove from Lansingburgh to Newport.

It has been voted to make the capital stock of the Winnsboro' (S. C.) Cotton Factory not less than $75,000—and not more than $250,000—operations to begin when $50,000 shall be subscribed. The subscriptions already made amount to about $25,000.

Witherow & Gordon, of New Castle, Pa., have just finished a huge engine of a hundred tons and eight hundred horse power for the Union Iron and Steel Company of Chicago. The cylinder is 36x72″ and the fly-wheel is 25 feet in diameter.

Morrison Brothers, Fort Madison, Iowa, will erect a new foundry and machine shop 30 x 120 feet with a wing 40 x 50 feet. They will also build an addition to their blacksmith shop 50 x 100 feet, to be devoted to heavy work.

A car wheel foundry is being built at Fargo, D.T., $100,000 having been subscribed. Mr. P. E. Mulcahy, president of the Elkhart (Ind.) car wheel works, will resign that position and manage the Fargo works, which are expected to be in operation by June 1st.

A co-operative carriage factory is about to be started at Rochester, N. Y. The capital stock of $200,000 has nearly all been taken.

The iron foundry at Cambridgeport, Mass., recently occupied by the Walworth Manufacturing Company, is to be continued by Walworth O. Barbour & Co., for the manufacture of all kinds of iron castings. Mr. Barbour has been for many years with the Walworth Manufacturing Co.

Cope & Maxwell Manufacturing Company, of Hamilton, Ohio, manufacturers of steam pumps and water works machinery have some 120 hands employed, and have recently added to a variety of designs that of an improved Worthington Duplex Pump, to work singly or duplex, not before accomplished.

Recently the Perry Stove Company, of Salem, O., sent a proposition to Mansfield, O., stating that if the citizens would raise $4,000 and donate them land for their buildings they would remove their works there. The proposition was promptly accepted, and the company have made arrangements to move there at once.

W. F. & John Barnes, Machinists, Rockford, Ills., write us: We are working about 70 men now; are building new shops this season that will give a floor capacity of 30,000 square feet; will build of brick and stone. Power and heating will be steam. Shall heat with over-hanging pipes that we have found very satisfactory during the past winter.

American built cars, locomotives and railway appliances generally, continue to increase in popularity abroad. From Italy comes now an inquiry for a number of Pullman sleepers, and every month of every year gives our American products a better standing. The future is certainly full of promise for our manufacturers of railway supplies.—*Railway Register.*

At Ionia, Mich., the Detroit, Lansing & Northern Railroad Company is erecting shops to occupy nearly eight acres of ground, and will include a large machine shop, a wood-working shop, a car erecting shop, paint shop and other smaller buildings. The round house will have a capacity of 30 engines. The whole plant is to cost about $100,000.

The real estate of the Newport, R. I., Manufacturing Company, comprising 44,500 square feet of land, with a factory building (brick), 200 feet long and 48 feet deep, has been sold at auction, at trustee's sale, to George H. Norman, for $16,000. The machinery remaining in the factory was sold for about $10,000. This property cost originally about $150,000.

M. C. Bullock has just shipped the last of a complete outfit of engines, boilers, machinery and Brush Electric plant for lighting an entire town, amounting in all to nearly $50,000. He is furnishing a similar outfit for Butte City, Montana Territory; is busily engaged on mining machinery to go to Lake Superior, and is operating his works 15 hours a day with 70 men.—*Chicago Industrial World.*

We have received from Riehle Brothers, Philadelphia, a copy of their illustrative price list of scales and a circular descriptive of their testing machines. The circular gives cuts showing forms of specimens to be tested upon the machine, such as cast iron, boiler plate, wire rope, chain, wood and stone, also, a long list of parties who have purchased the machines.

Chas. P. Willard & Co., 20 La Salle Street, Chicago, Ill., write us:

Our specialty is furnishing complete outfits for creameries and cheese factories, which just now take our little engines as fast as we can turn them out. We have within the past month added to our tools a Brainard Universal Milling machine and one Hendey Shaper, to make all parts of our product to gauge, and so far as practicable, interchangeable.

L. Katzenstein & Co., 35 Desbrosses Street, New York, have furnished the Southwark Foundry and Machine Company, Philadelphia, Pa., about 60 sets of Katzenstein's metallic packing this year. They are supplying two steamers of the Old Dominion line and three of the Pacific Mail line, with the packing. Among the steamships they have lately fitted with packings are the Servia, the Arizona and the Elbe. The largest steamers require about 2,000 pounds of packing. They have just sent packings for six locomotives to Cuba.

The Bridgeport Boiler Works, Lowe & Watson, Bridgeport, Conn., are very busy building their specialties, one of which is the Lowe boiler. They are now at work upon one 6 feet in diameter and 22½ feet long, which they rate at 125 horse power, but which is capable of doing a considerably greater duty. This is the largest boiler of the kind ever built. They are receiving more orders for large boilers than ever before, and so far have found it impossible to get any stock of new boilers on hand. Their business is as good now as at the same time last year. Orders began earlier this year than last.

The Rodney Hunt Machine Company, at Orange, Mass., have broken ground for their new foundry building. The main building will be 120x75 feet wide. The moulding room is 120 feet long and 30 feet wide; then there will be the sand, core, ladle and stock rooms on the side about 25 feet wide, and extending the entire length of the building. The pattern building is to be 100 feet long and 32 feet wide, two stories high, and situated upon the bank of the river, a little west of the old steam mill; while the main building will be opposite, on the side of the railroad track. The machine shops will be on an extensive scale.—*Boston Commercial Bulletin.*

Machinists' and Engineers' Supplies.

NEW YORK, April 6, 1882.

Business in the supply line has developed nothing new in the shape of activity since our last report. The dealers claim to be very busy but admit that they could do a little more.

The Babcock and Wilcox Company, 30 Cortlandt street, New York, have just issued the eighth edition of their Useful Information pertaining to the Generation and Use of Steam. This book is also a catalogue of their specialties.

Iron and Metal Review.

The Pig Iron market continues dull, and prices are unchanged. We quote: Foundry, No. 1, $25.50 to $26; Foundry, No. 2, $24 to $24.50; Gray Forge, $22. Foreign Iron, unchanged. Scrap dull at $31.50 from yard. Copper dull, at 18½c. for Lake Superior. Banca Tin 28½c. to 29c. Straits and Malacca 24¼c. to 24⅝c. Billiton and Australian 24¾c.

WANTED

"Situation and Help" Advertisements, 30 cents a line, each insertion. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted.—A first-class mechanical draughtsman, Apply, S. R. Krom, 153 Cedar Street, New York.

Wanted.—Several first-class tool makers on small tools, jigs, etc. Dueber Watch Case Co., Cincinnati, O.

Wanted—A good Machine Blacksmith, and 3 or 4 good Machinists. Address, EAGLE IRON WORKS, Des Moines, Iowa.

Wanted—A first-class boiler shop foreman to manage 150 to 200 men, and capable of laying out work. Apply with references to Frick & Co., Waynesboro, Franklin Co., Pa.

Wanted—A man thoroughly experienced in Portable and Traction Farm Engine building, to design and superintend building them. Address, stating experience and references, JOHN S. DAVIS' SONS, Davenport, Iowa

A Mechanical Engineer and Draughtsman of 24 years' experience, who has made hydraulic and steam engineering a specialty is open for engagement. Address, "Engineering," office AMERICAN MACHINIST.

Wanted—Two good men on small tools and small machine tool building. Also a man to take charge of a variety of small manufacturing, one having experience in modern shops. Address, Calipers, AMERICAN MACHINIST office, stating experience and giving references.

Machinists.—A Foreman Machinist, fully qualified to take charge in all the details of a small general machine shop in this city, can find a permanent position by communicating, stating experience, references and compensation. "New York" Box 6, Office AMERICAN MACHINIST.

Wanted—An experienced salesman or a good mechanic, with more or less experience, on steam engines, and with an aptitude for business, can secure a position as office and outside salesman with a first-class engine company. Address, stating qualifications, A.B. C., care AMERICAN MACHINIST.

A man 31 years of age desires a situation in a machine shop as superintendent or foreman. 13 years' experience as apprentice, journeyman, toolmaker, draughtsman and foreman in Illinois, Iowa, Minnesota, Nebraska, Kansas and Missouri. Correspondence invited from parties who mean business. J. E. McConnell, Iowa City, Iowa.

Wanted—An iron planer 40"x36"x12 feet. Address, C. B. Wilkins, Montgomery, Ala.

MACHINISTS.

We have several jobs that we wish to contract or employ suitable foreman to superintend. Any good mechanic can apply by mail or in person to the

JOEL HAYDEN BRASS CO.
LORAIN, OHIO.

SHEPARD'S CELEBRATED
$60 Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills Dogs, Calipers, "Sun Light" Gas Machines, etc. Send for catalogue of outfits for amateurs or artisans. Address

H. L. SHEPARD & CO.,
341 & 343 WEST FRONT STREET,
CINCINNATI, OHIO.

WORCESTER MACHINE SCREW CO.

MANUFACTURERS OF
STANDARD MACHINE SCREWS.

COOKE & CO.,

FORMERLY COOKE & BEGGS,
Dealers in MACHINERY AND SUPPLIES.
6 Cortlandt Street, New York.
AGENTS FOR

The Waters Perfect Governor,

Having Adjustable Speed, Automatic Safety Stop, Sawyer's Lever, and Solid Composition Valves and Seats.

ALSO,

SUPPLIES

For Machinists, Railways, Mills, Mines, &c.

Please send for circular and state that you saw the advertisement in this paper.

Holland & Thompson,
Troy, N. Y.
Manufacturers of the
HOLLAND
LUBRICATOR

For lubricating the valves & cylinders of steam engines.

Operating with **downward visible drop.** The Principle of this Lubricator is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other Patented Lubricator.

Protected with Letters Patent, granted July 5, 1881

☞ A saving of from 50 to 90 per cent. in cost of oils.

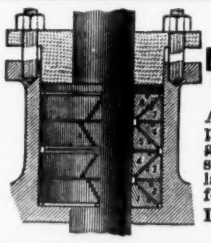
THOMAS D. STETSON,
PATENT SOLICITOR & EXPERT,

No. 23 Murray St., New York.

F. P. MICHEL,

Manufacturer of
Large Boring and Turning Mills, and Machinists' Tools generally.

ROCHESTER, N. Y.



KATZENSTEIN'S
Self-Acting
METAL PACKING
For Piston Rods, Valve Stems, &c.

Adopted and in use by the principal Iron Works, Engine Builders and Steamship Companies within the last eight years in this and foreign countries

L. KATZENSTEIN & CO.,
35 Desbrosses St., N. Y.

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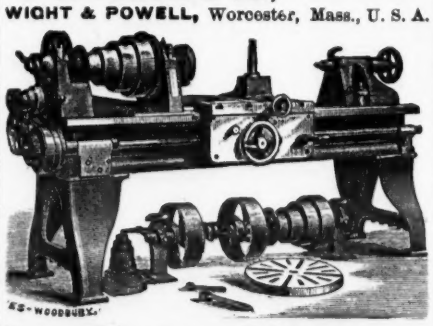
WIGHT & POWELL, Worcester, Mass., U. S. A.



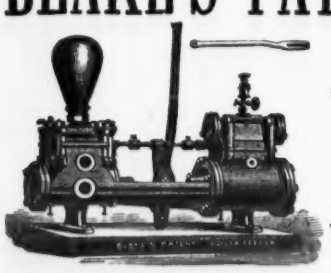
Iron Working Machinery.

MACHINE MOULDED MILL GEARING, SHAFTING, PULLEYS, ETC.

In great variety of sizes. Castings or finished work furnished the Trade at favorable rates.

POOLE & HUNT, Baltimore, Md.

BLAKE'S PATENT STEAM PUMPS.



MORE THAN 13,000 IN USE.

Adapted to Every Situation.

Send for New Illustrated Catalogue.

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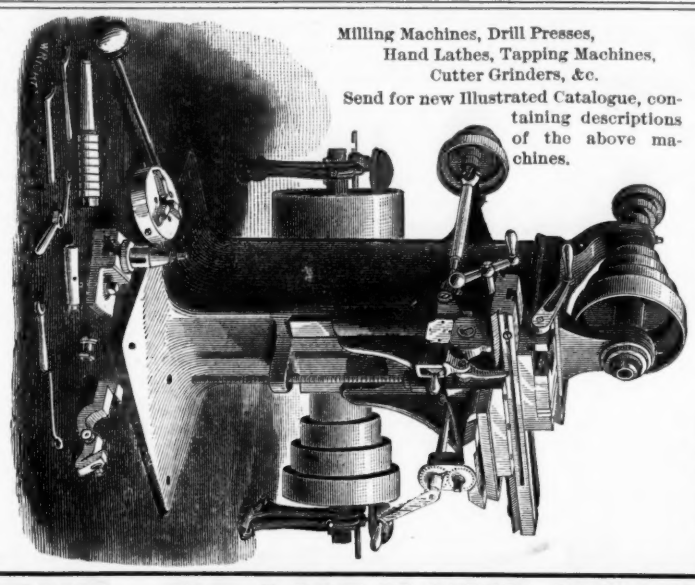
88 Liberty Street, NEW YORK. | *44 Washington St.,* BOSTON.



Office and Works, 139-143 Centre St., New York.

No. 2 Power Milling Machine. Price, as shown in cut, $400.00.

Milling Machines, Drill Presses, Hand Lathes, Tapping Machines, Cutter Grinders, &c.

Send for new Illustrated Catalogue, containing descriptions of the above machines.

E. E. CARVIN & CO.
MANUFACTURERS OF
Machinists' Tools.

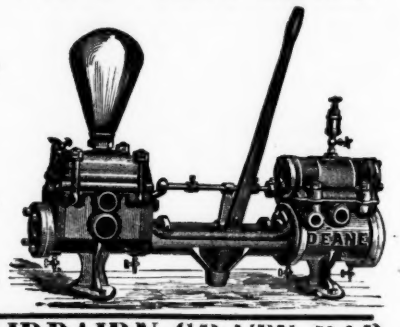
"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.

Send for New Illustrated Catalogue.

:o:

The Deane Steam Pump Co.
HOLYOKE, MASS.

92 & 94 Liberty St., New York. 54 Oliver St. Boston. 226 & 228 Lake St., Chicago.



OUR WORKSHOPS,

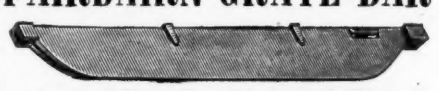
Factories and Warehouses. Their Sanitary and Fire-resisting Arrangements. By B. H. THWAITE, C. E., with 183 illustrations of the most improved Fire, Sanitary and Ventilating arrangements. 8vo, cloth, $3.50. Free by mail.

E. & F. N. SPON, 446 Broome Street, N. Y.

FOR SALE.
STEAM ENGINES.

Two Horizontal Engines, 26 inch cylinder, 42 inch stroke, about 250 horse power, **built by NOVELTY WORKS**, will be sold connected or separate. Apply to **JOHN LEAVENS, No. 81 Front St., Brooklyn, N. Y.**

FAIRBAIRN GRATE-BAR



Improved Combustion of Coal and Its Gases.

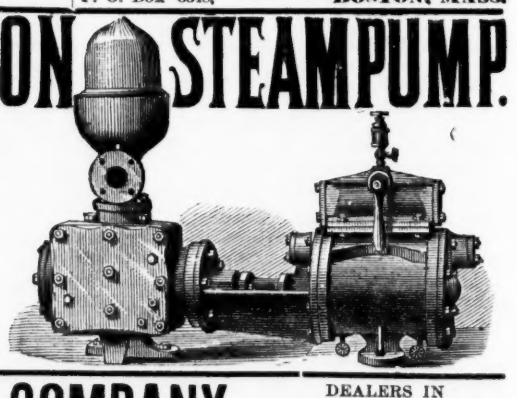
Saving in Fuel. Burns all kinds. Increased capacity of Furnace. A Ventilated Grate-Bar. No New or Peculiar Boiler Setting. A Simple Device for Economy.

The Fairbairn Manufacturing Co.,
272 PURCHASE STREET,
P. O. Box 3348, **BOSTON, MASS.**

THE CAMERON STEAM PUMP.

Is the Standard of Excellence
AT HOME AND ABROAD.

THE A. S. CAMERON
STEAM PUMP WORKS,
Foot of East 23d Street, New York.



H. PRENTISS & COMPANY,

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DEALERS IN
MACHINISTS', MANUFACTURERS' AND RAILWAY
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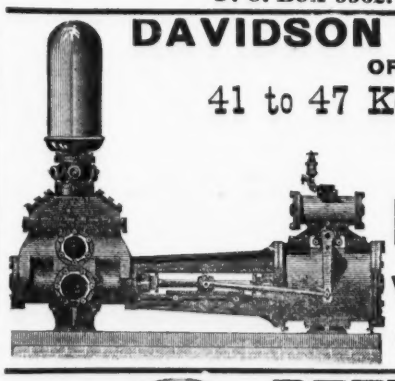
DAVIDSON STEAM PUMP CO.

OFFICE AND WORKS:
41 to 47 Keap Street, Brooklyn, N. Y.
MANUFACTURERS OF
THE M. T. DAVIDSON
Improved Steam Pump.



Warranted the Best Pump Made for all Situations.

KELLY & LUDWIG, Agents, 49 and 51 North 7th St., Phila., 97 Liberty St. New York.

STANDARD CALIPER GAUGE.
Cheapest and Best in Use.
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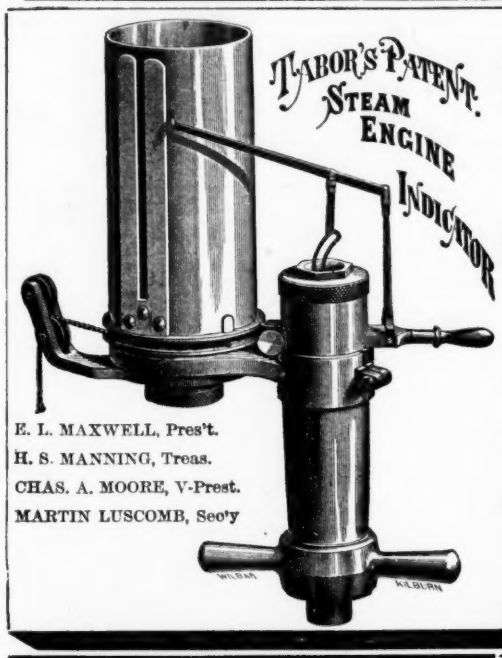

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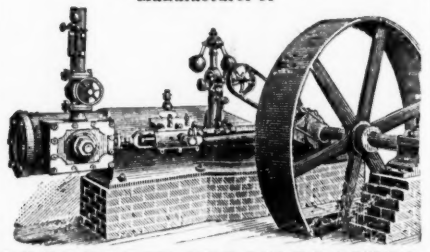

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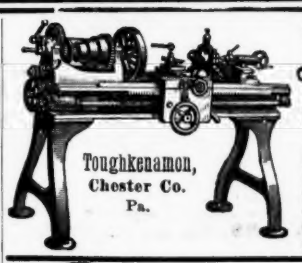

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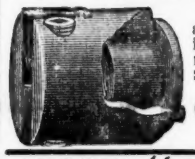

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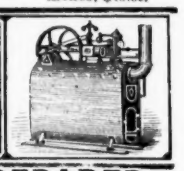

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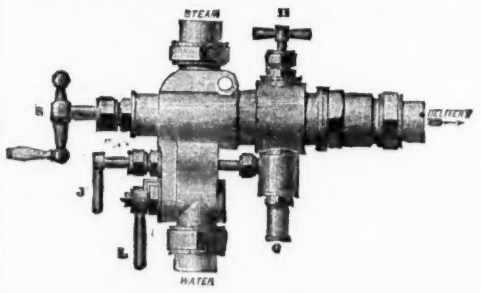

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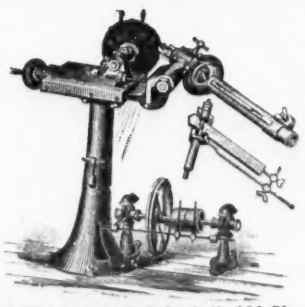

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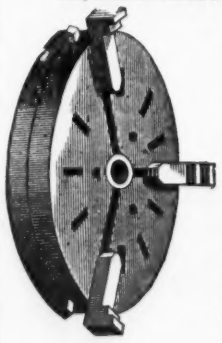

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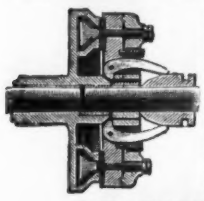

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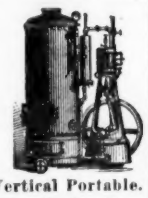

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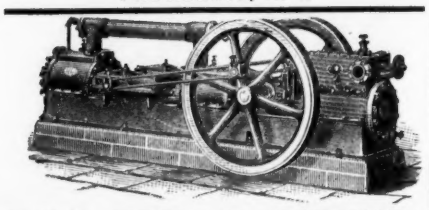

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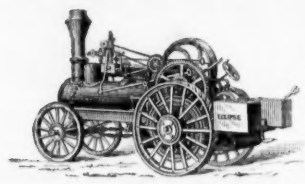

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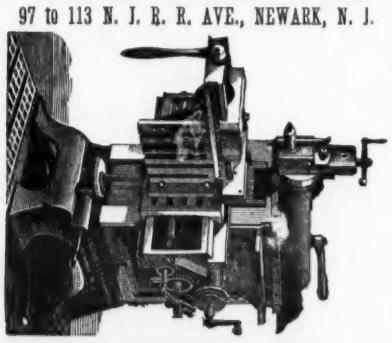

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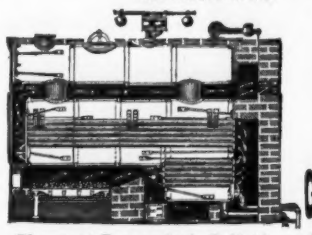

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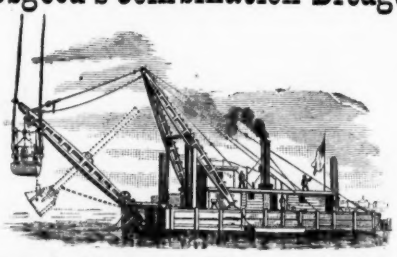

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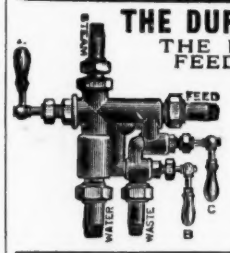

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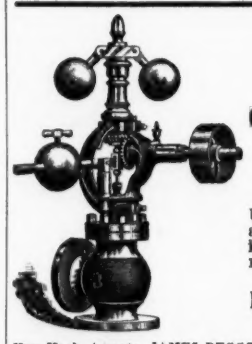

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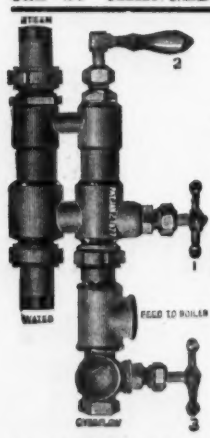

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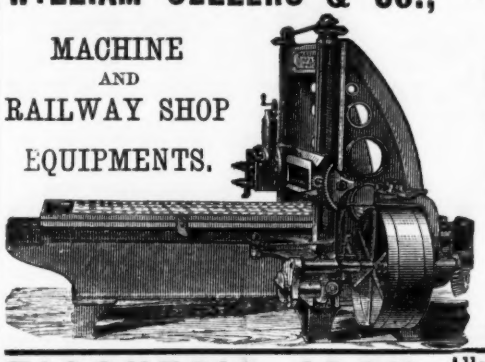

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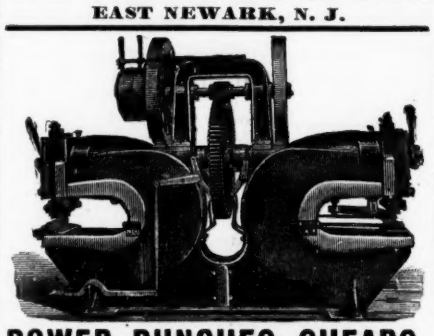

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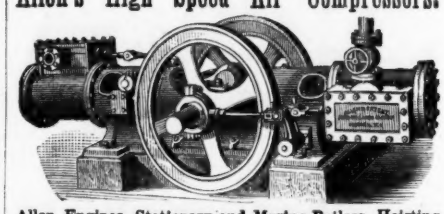

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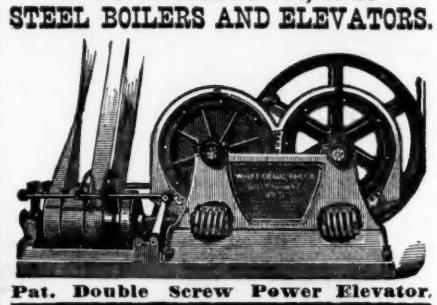

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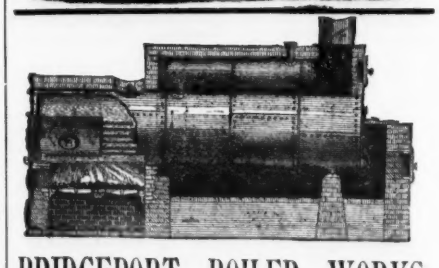

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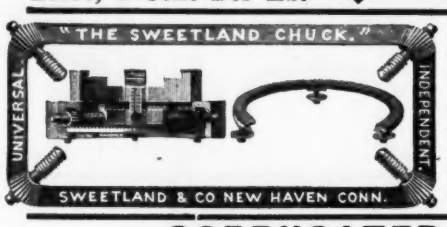

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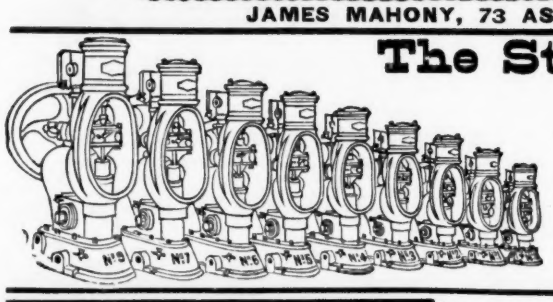

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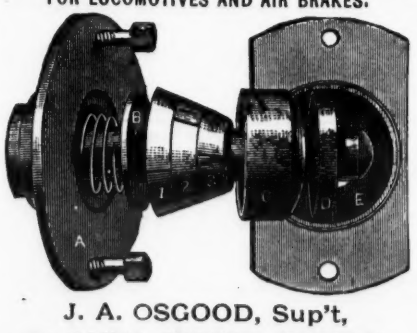

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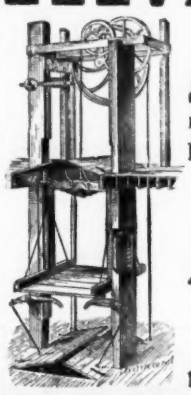

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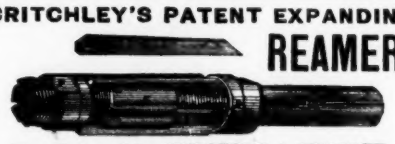

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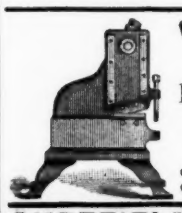

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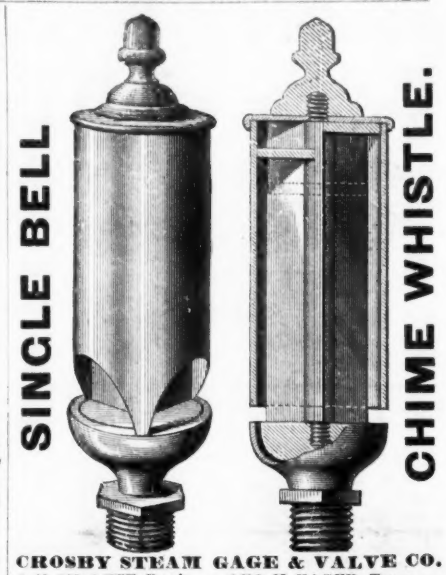

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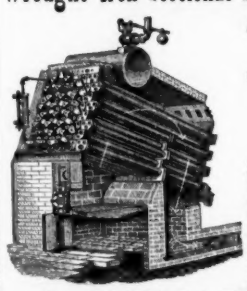

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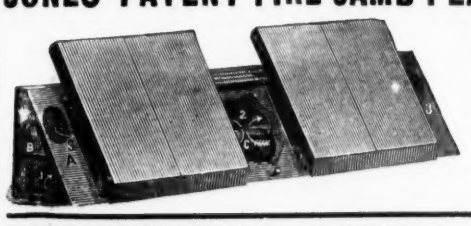

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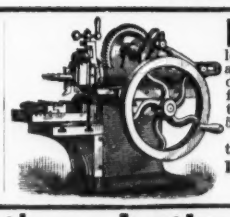

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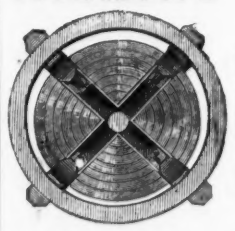

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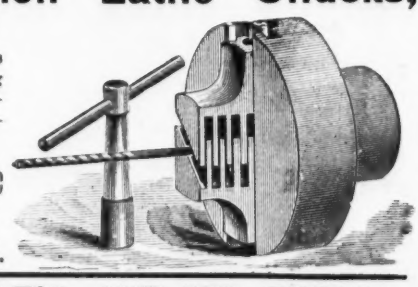

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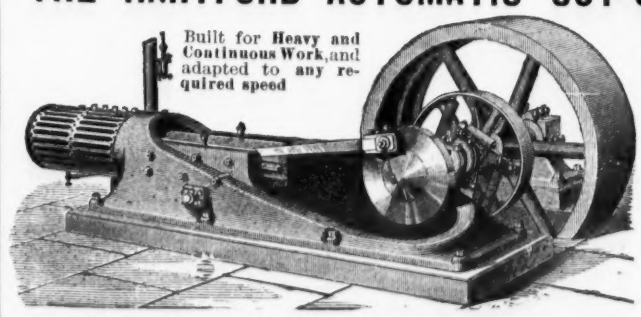

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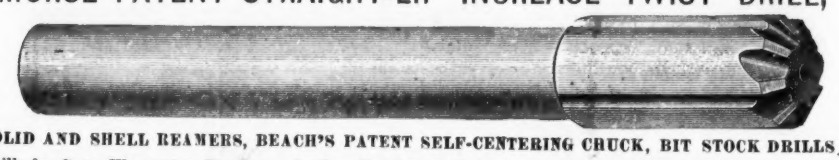

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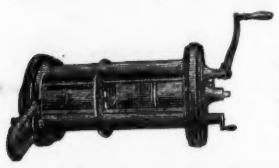

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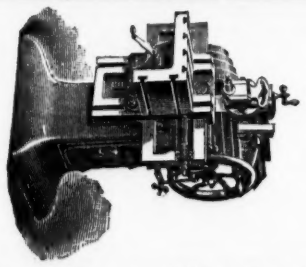

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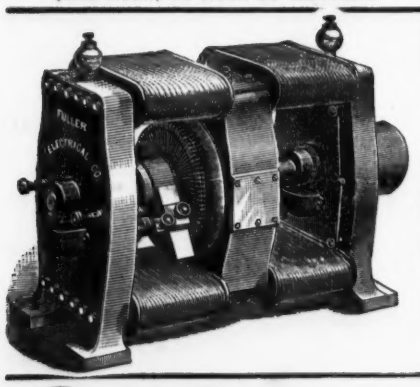

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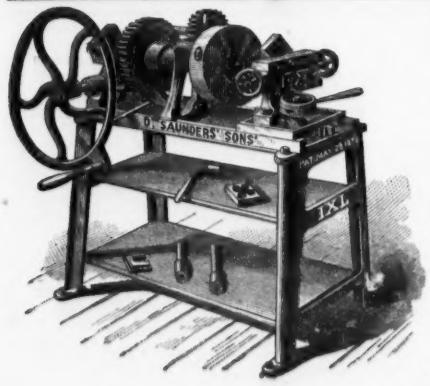

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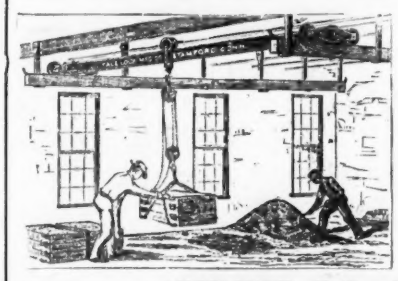

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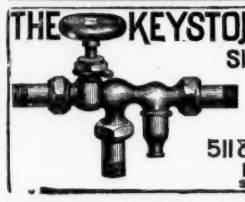

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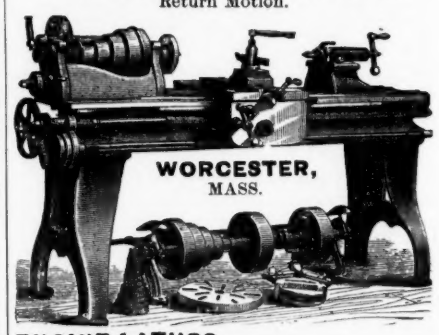

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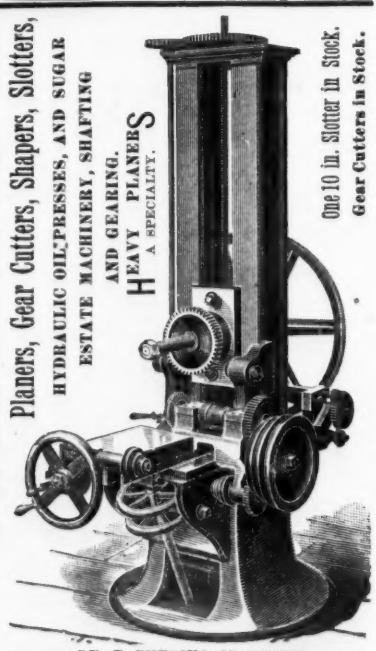

GEAR CUTTING MACHINE.

WOODBURY, BOOTH & PRYOR,

Manufacturers of

Automatic Cut-Off, Fixed Cut-Off, and Slide Valve STEAM ENGINES, Tubular Boilers.

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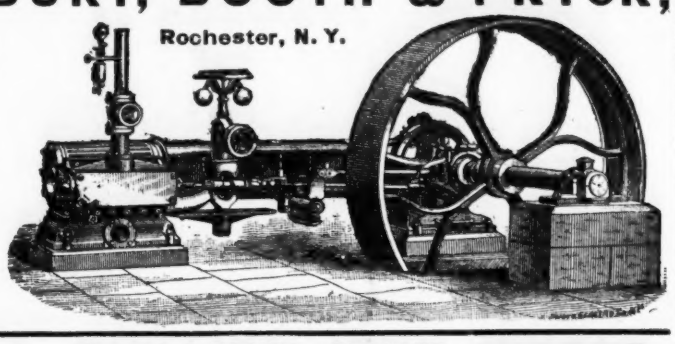
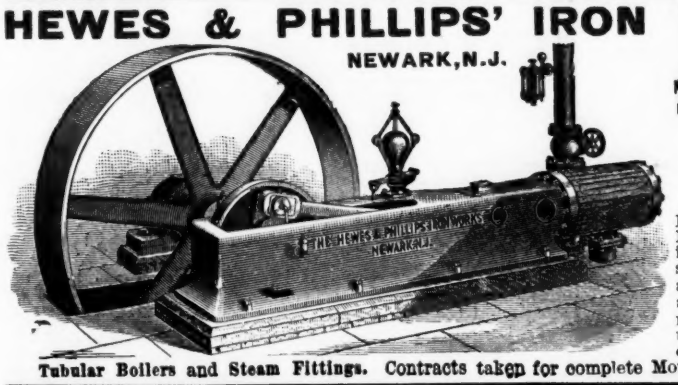


HEWES & PHILLIPS' IRON WORKS,

NEWARK, N.J.

Manufacturers of

The ALLEN PATENT HIGH-SPEED ENGINE.



Both Condensing and Non-Condensing, especially designed and constructed for the Rolling and Cotton Mill Trade, and all establishments requiring an absolutely uniform and economical power.

Tubular Boilers and Steam Fittings. Contracts taken for complete Motive Power Outfits.

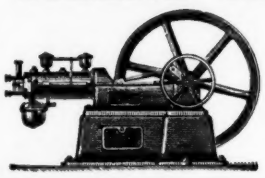
NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.

Started Instantly by a Match, it gives full power immediately.

When Stopped, all Expense Ceases.

No explosions; No Fires nor Cinders; No Gauges; No Pumps; No Engineer or other attendant while running.



Unsurpassed in every respect for Hoisting in Warehouses, Printing, Ventilating, Running small Shops, etc. 2, 4 and 7 H. P. and upwards.

Built by

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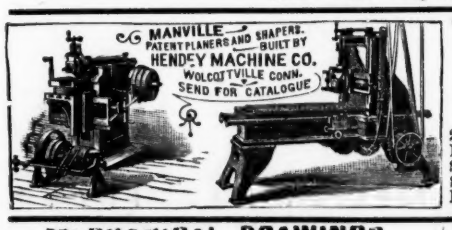

The Hendey Machine Co.

TORRINGTON, CONN., U. S. A.

Manville Patent Iron Planers and Shapers.

15 in. Shapers, 24 in. Shapers, 3½ ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 8 ft. x 24 in. Planers, Amateurs' Hand Planers, with chuck and centers, Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck, and Common Clock Lathes. Catalogue gives many names of users of our tools.

MECHANICAL DRAWINGS.

Copies or Tracings of any class of machinery made and used in Europe. 2000 designs. **WOOD & RICHMOND,** Mechanical Engineers and Draughtsmen, 176 Broadway, N. Y.

Second-Hand & New MACHINERY.

MARCH 29, 1882.

Two Engine Lathes, 42 in. x 16 ft. Triple Geared. Ames. New. June 1.
One Engine Lathe, 36 in. x 18 ft Fifield. New. Aug. 1
One " " 20 in. x 16 ft. Fifield. New. June 1
One " " 24 in. x 12 ft. " " July 1
One " " 24 in. x 10 ft. " "
One " " 24 in. x 10 ft. New Haven.
One " " 20 in. x 12 ft. Ames. New.
One " " 20 in. x 8 ft. " New.
One " " 18 in. x 10 ft. Jones & Lamson. New.
Three Engine Lathes 18 in. x 8 ft. Jones & Lamson New.
One Engine Lathe, 18 in. x 7 ft. Armsley & Harrington. Good order.
One Engine Latne, 18 in. x 7 ft. Thayer & Houghton. Good order.
One Engine Lathe, 16 in. x 6-7-8 ft. Bridgeport Mch. Tool Works. New.
Six Engine Lathes, 16 in. x 6 ft.-7ft. x 8 ft. Ames. New.
Two " " 15 in. x 6 ft. Jones & Lamson. New.
Two " " 15 in. x 6 ft. Frather's. New.
One " " 15 in. x 6 ft. with Turret. Flathers New.
Two Engine Lathe, 14 in. x 6 ft. Star Tool Co. New.
One " " 13 in. x 6 ft. Ames. New.
One " " 13 ft. x 5 ft. " "
Six Hand Lathe. 12. in x 5 ft., Hendey. New.
One Planer 17 in. x 3½ ft. Good order.
One " 20 in. x 4½ ft. Thayer & Houghton. Good ord
One Planer 24 in. x 5 ft. New Haven. Good order.
One " 24 in. x 5 ft. Whitcomb A1.
Two " 26 in. x 6½ ft. Brettell. New.
One " 24 in. x 6 ft. Ames. New.
One " 30 in. x 8 ft. Fitchburg. New.
One " 37 in. x 10 ft. Second-hand. Good ord r.
One 6 in. Stroke Shaper. Boynton. New.
One 15 in. Stroke Shaper. Hendey. New.
One 15 inch Stroke Shaper. Gould & Eberhardt. New.
One 20 in. Stroke Shaper. G. & E. New.
One 24 in. Stroke Shaper. Hendey. New.
One Screw Machine. New Pattern. Wire Feed.
Four 16 in. Upright Drills. Prentiss. New.
One 20 in. Upright Drill. " "
Two 22 in. " " " "
One 24 in. " " Ames. New.
One 38 in. " " New Haven. New
Three Sensitive Drills.
25 Lincoln Millers and Vises. Good order.
One No. 3 Garvin Hand Miller. New.
One 10 lb. Air Hammer. Hotchkiss. Good order.
One 200 lb. Bradley Hammer. A1.
One 60 lb. Bradley Hammer. New.
All sizes Bradley Hammers furnished to order promptly.

E. P. BULLARD,

14 DEY ST., NEW YORK,

General Eastern Agent for AKRON IRON CO.'S Patent Hot Polished SHAFTING.

Large Side or Surface Planer

FOR SALE.

Intended for planing heavy castings; full capacity, 12' long, 4' high; is strongly geared and in first-class condition.

S. T. LUND,

71 OLIVER STREET, BOSTON, Mass.

New & Second-Hand MACHINERY.

APRIL 4, 1882.

2 Engine Lathes, 14 in. x 6 ft. Grant & Bogert. New.
1 " " 22 in. x 10 12 ft. " "
1 " " 16 in. x 6 ft. Ames. "
1 " " 17 in. x 6 ft. Blair. "
1 " " 18 in. x 8 ft. Lodge & Barker. "
1 " " 24 in. x 12 ft. Fifield. "
2 " " 12 in. x 5 ft. Young. "
1 " " 12 in. x 4 ft. Washburn. "
1 Hand " 12 in. x 5 ft. Garvin. "
1 " " 10 in. x 4 ft. " "
1 Fox " 15 in. x 5 ft. Pike & Dean. "
1 " Turret " 18 in. x 5 ft. " " "
1 Planer, 24 in. x 24 in x 6 ft. Whitcomb. "
1 " 24 in. x 24 in. x 6 ft. Woodman. "
1 " 24 in. x 24 in. x 6 ft. 2d-hand. Good order.
2 20 in. Upright Drills. Prentiss. New.
2 16 in. " " " "
1 30 in. " " " "
1 Schlenker Bolt Cutter to take size from ¼ to 1¼ inches inclusive. New.

NEW YORK AGENCY OF THE TANITE CO:

H. PRENTISS & CO.,

42 DEY STREET, NEW YORK.

THE PORTER-ALLEN HIGH SPEED ENGINE.

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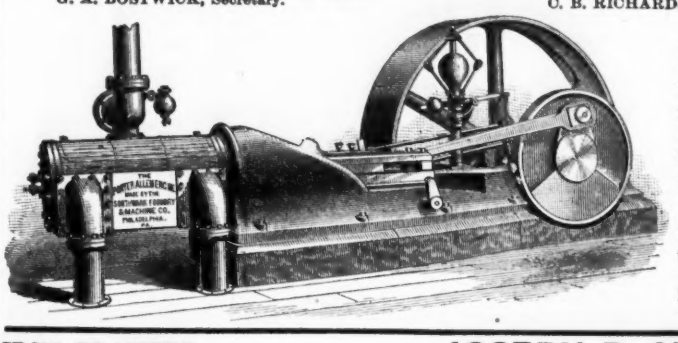

THE SOUTHWARK FOUNDRY & MACHINE CO., Philada., having largely increased its facilities is now prepared to fill all orders for the Porter-Allen Engine on contract time.

Orders solicited for Iron and Brass Castings in the rough.

Address the Company, 430 Washington Avenue, Phila., Pa.

IRON PLANERS, DRILLING MACHINES, ENGINE LATHES, IRON SHAPERS, ENGINES & BOILERS

A GENERAL LINE OF

IRON AND WOOD WORKING

MACHINERY.

TOOLS & SUPPLIES

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Manufacturer of the **MATTHEWS**

Patent Automatic High-Speed Engine,

For Electric Lights and other purposes requiring steady, reliable power. The best and cheapest in the market. 25 H. P. for $500. Also, manufacturer of the Matthews PATENT PLANING MACHINE.

THE ALLIGATOR WRENCH,

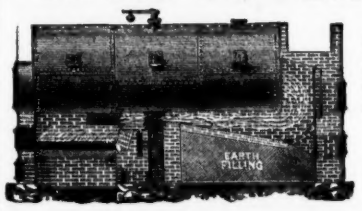
Patented Aug. 31, 1875.

Teeth cut diagonally. Grips Round Iron or Pipe.

AMERICAN SAW CO.

TRENTON, N. J.

JARVIS PATENT FURNACE FOR SETTING STEAM BOILERS.



Economy of Fuel, with increased capacity of steam power. The same principle as the SIEMANS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire. Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c. **A. F. UPTON, General Agent,**

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NEW AND SECOND-HAND MACHINERY

For Sale, in Store March 17th, 1882, at Chicago, Ill., by W. A. James & Co.

New Planers.

One 9 ft. x 32 in. x 32 in. Betts Machine Co.
One 11 ft. x 36 in. x 36 in. " " "
One 13 ft. x 36 in. x 36 in. " " "
One 8 ft. x 26 in. x 26 in. Pond.

Second-Hand Planers.

One 4 ft. x 24 in. x 20 in. New Haven Mfg. Co.
One 7 ft. x 24 in. x 24 in. Cone Machine Co.
One 8 ft. x 33 in. x 26 in. Williams, Rich & Co.
One 6 ft. x 26 in. x 26 in. Aldrich.
One 14 ft. x 72 in. x 48 in. Schenectady.
One 3 ft. x 17 in. x 12 in. Lathe & Morse.

New Engine Lathes.

One 18 ft. x 48 in. Fifield.
One 18 ft. x 36 in. "
One 16 ft. x 22 in. "
One 12 ft. x 24 in. "
One 16 ft. x 26 in. Perkins.
One 20 ft. x 36 in. Fifield.
One 8 ft. x 20 in. Perkins.
One 16 ft. x 26 in. Niles Tool Works.
One 6 ft. x 16 in. Perkins.
One 8 ft. x 17 in. "

Second-Hand Engine Lathes.

One 12 ft. x 39 in. New Haven.
One 18 ft. x 32 in. "
One 11 ft. x 28 in. Ames Mfg. Co.
One 15 ft. x 24 in. Double Head.
One 17 ft. x 32 in. New Haven.
One 10 ft. x 20 in. Lathe & Morse.
One 6 ft. x 15 in. Putnam.
One 7 ft. x 19 in. Lathe & Morse.

Great variety Shapers, Pulley Turning Machines and Grinding Machines will be sold cheap by

W. A. JAMES & CO.,

273 & 275 South Canal St., Chicago, Ill.

HILL, CLARKE & CO.

36 OLIVER STREET, BOSTON, MASS.

NEW MACHINE SHOP TOOLS.

List of Sizes for Quick Delivery.

LATHES.

6 in. swing, 6 ft. bed. Ames.
16 " " 6 " " Nutted. Barnes.
17 " " 6 " " Wright. (on hand)
19 " " 8 " " Gray.
20 " " 10 " " Fifield.
20 " " 12 " " "
21 " " 10 " " Blaisdell.
24 " " 12 " " "
26 " " 12 " " Lathe & Morse.
26 " " 26 " " Powell.
36 " " 16 " " Fitchburg.

PLANERS.

16 in. x 16 in. x 3½ ft. Parker.
20 in. x 20 in. x 5 ft. Hendey.
22 in. x 22 in. x 4 ft. Pease.
22 in. x 20 in. x 4 ft. Pond.
24 in. x 24 in. x 6 ft. Ames.
24 in. x 24 in. x 6 ft. Hendey.
26 in. x 26 in. x 6 ft. Gleason
30 in. x 30 in. x 10 ft. Fitchburg.
32 in. x 32 in. x 10 ft. Gleason.

2 No. 2 Cabinet Turret Lathes
1 " 1 Fox Lathe,
} Immediate delivery.

SECOND-HAND and NEW MACHINERY

April 5, 1882.

The following New and Improved Machinists Tool are part of what we have for early delivery.

1 36 in. x 36 in. x 9 ft. Iron Planer. 2d-hand. April.
2 30 in. x 30 in. x 8 ft. Planers. New. April.
2 30 in. swing, 15 ft. bed. Engine Lathes. "
1 22 in. swing, 13½ ft. Bed Engine Lathes. "
5 22 in. x 12 ft. Engine Lathes. April.
3 19 in. swing, 10 ft. Bed Engine Lathes. April.
4 11 in. " 5 ft. " " April.
2 30 in. " Upright Back Geared Drills. "
2 9 in. Shapers. New. April.

The following on hand:

1 30 in. swing, 15 ft. Bed Engine Lathe.
2 19 in. " 10 ft, " " New.
2 19 in. " 8 ft. " " "
2 18 in. " 8 ft. " " "
1 17 in. " 6 ft. " " 2d-hand.
1 14 in. " 6 ft, " " New.
1 12 in. " 4 ft. " " 2d-hand.
1 12 in. " 4 ft. " " New.
1 15 in. " 9 ft. Hand Lathe. New.
1 10 in. " 4½ ft. Bed Hand Lathe. New.
1 Boring Lathe, 16 ft. bed. 48 in. swing.
1 Round Arbor Fox Lathe. Fine order.
2 48 in. Swing Radial Drills. New.
2 38 in. Swing Upright Drills. B. G. & S. F. New.
1 24 in. Swing Upright Drill. Ames. New. B.G&S.F
1 20 in. Upright Drill. Back Gear. New.
1 18 in. Bench Drill.
2 Wall Drills, heavy. Second-hand. 60 and 72 in
1 11 in. Shaper, 25 in. Traverse.
1 6 in. Shaper. New. Hand or Power.
1 Index Miller.
2 Milling Machines, Lincoln pattern. Second-hand
2 Manhattan Arms Co. Millers. Second-hand.
1 Sellers Milling Machine. 2d-hand.
1 Face Milling Machine. Second-hand.
1 Pond's Double Milling Machine. 2d-hand.
1 No. 2 Screw Machine. New. Turret Head.
1 Screw Head Slotter. Second-hand.
3 Second-hand Profiling Machines.
5 4½ in Hyde's Patent Centering Machines. New.
1 Emery Grinder, 2d-hand. for 10 in. Wheels.
1 Pipe Cutting Machine. Second Hand. 2 in.
1 1¼ in. Wood & Light Bolt Cutter. New.
1 Bolt Pointing Machine. Second-hand.
1 Double Nut Tapper. New.
1 Horizontal Boring Mill, 48 in. Swing.
1 Horizontal Boring Machine, 10 in. Swing. 2d-hand.
1 Betts, No. 2, Power Punch. New.
4 Double-Acting Presses, No. 3, nearly new.
4 Single-Acting Presses, for power, "
100 Foot Presses, nearly new.
1 Medium Power Punching Press. Second-hand.
2 Small " " Presses. "
1 Foot Punch, with bench. New.
1 Lot Pistol Machinery. Second-hand.
3 Grind Stones and Frames.
1 300 lb. Steam Hammer. 2d-hand.
1 Crane. Second-hand. 20 ft. jib. 6 Tons.
1 4 Side Moulding Machine. New. 8 in.
Lot of Forges 1 Band Saw, 1 Slat Tenoner, 1 Railway Saw Bench, 1 Foot-power Circular Saw, Cold Rolled Shafting, Palleys, Hangers, Couplings, &c., always in store.

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PROVIDENCE, R. I.

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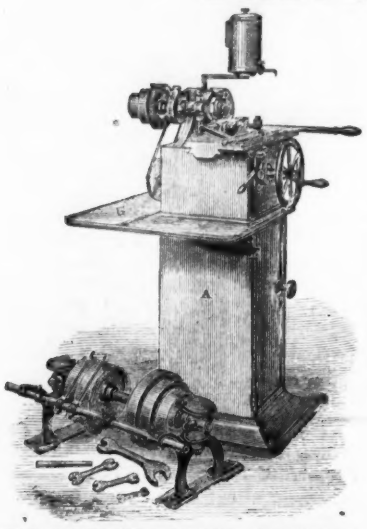
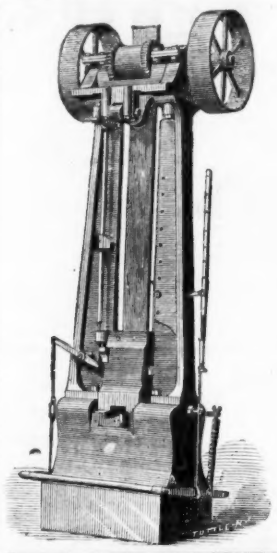
Machinery and Tools.



PLAIN MILLING MACHINE. (Small Size.)

This machine is designed for ordinary milling operations upon small work. There is the usual automatic feed operating the table, and a hand-lever attachment, either of which can be made use of, as the character of the work to be done may require. The spindle of the machine is provided with anti-friction bearings and arrangements to close up as wear takes place. Attached to the stand and bed is the pan G, forming a convenient place for tools, work and waste. Overhead works accompany the machine.

Whole length of table, 20 inches; whole width of table, 7¼ inches; distance of feed of table, 9 inches; height of centre above table, lowest point, 1½ inches; height of centre above table, highest point, 3¾ inches; vise jaws, 3½ inches long, ¾ inch deep. Weight, boxed ready for shipment, about 750 lbs. Price, boxed and delivered at Railroad or Steamer in Providence, $260.



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Gun, and Sewing Machine Machinery.

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This Drill can be changed from **Right to Left Hand Drilling** by simply moving the Pawl to right or left.

Price for 10¾" with Socket, to Handle Drills, from ¼" to 29-32" inclusive, and ocket, for Square Shank Drills, $14.00.

Price for 13¾ with Two Sockets, to Handle, Drills from ¼" to 1¼" inclusive, and Socket for Square Shank Drills, $18.25.

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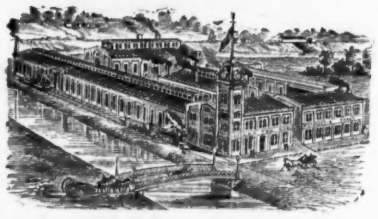

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DRIVING WHEEL LATHES,

Hydrostatic Wheel Presses,
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Car Wheel Borers,
Screw Machines,
Universal Radial Drilling Machines,
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Special Pulley Boring Machines,
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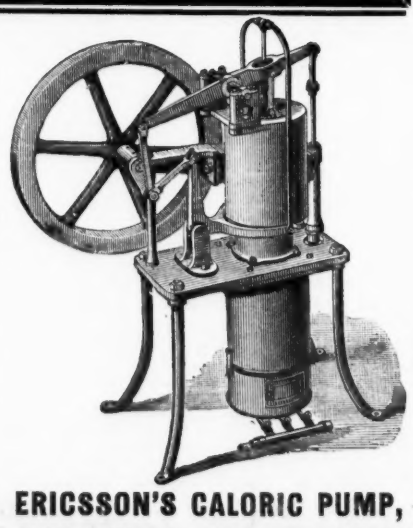

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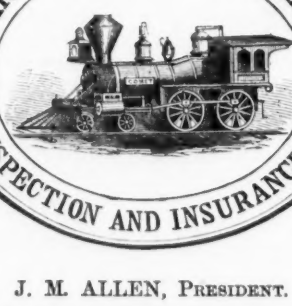

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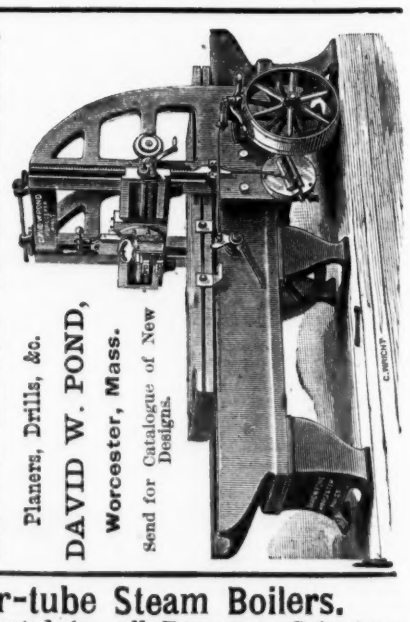
W. B. FRANKLIN, Vice-President.
J. B. PIERCE, Secretary.



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Punching Presses
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For the manufacture of all kinds of
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Electrical and Intricate Core Work a Specialty.

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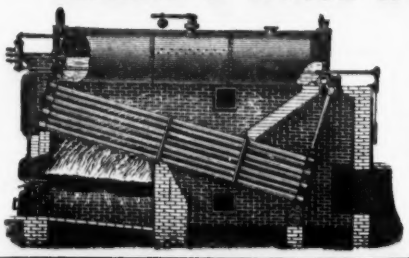

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Centennial Exposition Medal awarded this boiler for highest economy and efficiency on test.

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Emery Wheels & Grinding Machines.

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St. Louis, 208 North Third St.
St. Louis, 811 to 819 North Second St.
Cincinnati, Cor. of Pearl & Plum Sts.
Pittsburgh, 137 First Ave.
Indianapolis, Cor. Maryland & Delaware Sts.
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San Francisco, 2 & 4 California St.
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